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The Coal Situation—An Editorial

WHILE advices from Indianapolis and Washington indicate an early resumption of bituminous coal mining in all fields, the country is still suffering under the most stringent and far-reaching fuel restrictions in its history. Particularly in Chicago and in the Middle West has the need for unprecedented curtailment been necessary. Many factories are closed and all others are working on a part-time basis. Stores are only open between the hours of 12 noon and 6 p. m. and street and interurban railway service has been reduced to a minimum entirely inadequate for the needs. And as this issue of ELECTRICAL REVIEW goes to press orders are being sent out for still further curtailment in every direction.

Every restricting order is being met in a splendid spirit of Americanism. No one questions the justice or authority of the steps that are being taken but all are willing and anxious to co-operate for the common good.

Naturally, our own publishing facilities have been seriously curtailed; hence this issue of considerably fewer pages than usual. With publishers already facing a critical shortage of paper and with the fuel restrictions that have now come to pass, the outlook is anything but favorable. However, we bespeak the patience and co-operation of our readers in this crisis. Nothing will be left undone to continue on the best basis possible with hopes for the early return to normal conditions.

The central stations, being the largest consumers of coal next to the railroads, naturally were most affected by the strike. The National Electric Light Association's committee, headed by John W. Lieb, which did such notable work during the war, was again called into service to assist utilities in getting coal supplies, and while this committee has done its utmost, the Federal Railroad and Fuel Administrations either have underrated the coal needs of the Central West or have been unable to supply fuel from other sources.

The situation in Chicago and vicinity became so critical as the result that a committee of five leading business men with Samuel Insull, president of the Commonwealth Edison Co., Chicago, chairman, appealed to the Illinois Public Utilities Commission to reduce the loads on utilities. Plans which were ultimately adopted provided for spreading out the load to get greater diversity-factor, cut the peak load and improve load-factor so as to dispense with as much reserve capacity, banked fires, etc., as possible. According to Mr. Insull, the Commonwealth Edison Co., as the result of the restrictions enforced, had cut down its peak load 34% and on Dec. 6 had reduced its output over 25%. Similar conditions obtained in other communities where like restrictions were enforced.

It is undeniable that the coal reserve maintained by utilities generally has virtually saved the nation, yet many central stations had smaller stocks of coal on hand this year than in previous years. High prices and a feeling that peace had settled conditions are probably responsible for this. Steadier work is one of the conditions which are due to the miners in mere justice. The central stations are one of the largest consumers of coal. If they buy more coal during the summer or off months, they will be enabled to maintain larger reserves, probably obtain a better unit price and enable the miners to obtain steadier work.

At present we do not feel that the miners deserve very well of the country after the manner in which they, or their leaders, issued an ultimatum of complete capitulation to their demands or annihilation. However, the coal problem will be settled only when settled right. This means among the first things that the miners must be offered continuous employment. Summer buying by all central stations, and thereby the maintenance of larger coal reserves than usual to guard against unforeseen contingencies, is necessary.

Collective bargaining is recognized. This means that until some way can be evolved for other methods of settlement, the country is at the mercy of such bodies of men controlling the key industries as coal and transportation. The steel strike affected the country but little. The coal strike has paralyzed a large section of the country, and we are not yet out of the dilemma. A protracted strike of the railroad men might work even greater havoc.

Industry seems to be in a bellicose state. There is increasing ill-feeling between the unionized and the nonunionized workers, not civil war, but a feeling by the latter that they are being exploited by the former. There is not peace between the employer and the employe, a condition often incorrectly spoken of as war between capital and labor.

The sum total of these things is that the central stations must lay in larger stores of coal in future, for recent events have taught the value of the coal pile.

Central-Station Rates in Theory and Practice

Twenty-third Article — Public Utility Regulation by State Commissions—Organization and Procedure of Commissions—Scope of Their Powers as to Rates, Service, Capitalization, Etc.

By H. E. EISENMENGER

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This is the twenty-third article of this series which began in the issue of July 12. Part I consisted of seven articles on the cost of electric service. Part II included six articles on the principles governing selection of a rate system. The six articles in Part III dealt with the various rate systems in use. Two articles constituted Part IV on rate analysis. Last week's article included Part V on accuracy of rates and began Part VI, which is continued in the present and will be concluded in the two remaining articles of the series.

PART VI—PUBLIC UTILITIES AND PUBLIC REGULATION—(Continued).

CONTRIBUTED BY S. F. WALKER,
Formerly Associate Editor of Rate Research.

II. REGULATION BY COMMISSION.

UTILITY COMMISSIONS MUST BE DISINTERESTED AND UNBIASED ADMINISTRATIVE BODIES.

COMMISSIONS are not courts of punishment, but are administrative bodies intimately related to many phases of the utility business. A commission should not usurp the position of management in determining the development and operation of a utility, but as an administrative body, act in a corrective and advisory capacity. The underlying authority for the regulatory powers vested in commissions is the common-law principle that all business affected with a public interest is subject to public regulation.

Unbiased Judgment versus Home Rule.—The difficulty in regulation of public utilities by local franchises was that the municipality was a party to the contract and at the same time acted as the regulatory body. Therefore, free service to the municipality was exacted of the companies, heavy paving requirements, special taxes, unprofitable extensions and other unjustifiable burdens were placed upon the companies to their detriment and also to the detriment of the general public served by the utilities.

A statewide interest as against the companies operated in several states, such as railroad companies, natural-gas companies, or interstate power companies, may affect the judgment of the state commission to shade the findings in favor of a low rate for service within the state.

In order to secure an unbiased point of view the regulating body must be the agent of a larger unit than that affected by the regulation. State commissions pass upon the rights and privileges of the city and the local companies; the Interstate Commerce Commission deals with matters affecting the often conflicting interests of different sections of the United States.

In the future certain public utilities may outgrow the limits of state commissions and provision may be made for the delegation of matters affecting interstate operation of power-transmission companies, natural-gas companies and similar industries to an interstate or national commission.

Another consideration which favors regulation by state commission rather than by the municipality is that men with the desired education and training, capable of exercising the broad administrative powers affecting various industries, cannot readily be secured for local commissions. Furthermore, extensive investigations are often called for in determining proper standards of service, in adopting a policy of rate making or in deciding the advisability of adopting new inventions and improvements in operating conditions, which investigations can be conducted by the state body for the benefit of the industry in the entire state. The necessary equipment, such as meter-testing equipment is not often available to the local body, but may be acquired by the state commission for use throughout the state, or the state commission may use certain equipment jointly with other state departments or the state university.

Special Laws.—Prior to the establishment of commissions, special laws had been passed in some states, fixing a rate or standard of service for individual companies or for the railroads, gas, electric or other public utilities throughout the state.

This sort of regulation is too haphazard and limited in scope. Furthermore, it has the objection obtaining in the case of regulation by local franchise, that of inflexibility. The rate or service requirement, if reasonable when the special law or franchise became effective, may not continue reasonable and suitable to developments throughout the term of the franchise or the period during which the law remains in effect.

After the establishment of commission regulation there should be no occasion justifying the passage of a special law of this kind; and the special laws already passed should be nullified to give the commission entire freedom to make changes when they are found to be justified, the special rates and regulations to remain in effect only until reasonable rates and regulations can be determined by the commission.

COMMISSION ORGANIZATION.

The majority of the state laws provide for three members on a commission, but there are commissions of four, five and seven members. The majority of the laws also provide for appointment of the commis-

sion by the governor, by and with the consent of the senate. In some of the laws, provision is made for the election of the commissioners by the people, but the appointive commission has grown in favor, and this plan is adopted in the laws most recently enacted.

Term of Office.—The different state laws provide for a term of office for the commissioners varying from two to ten years, but the term most common is that of six years.

The body is given a greater degree of stability by providing for the expiration of the term of but one commissioner at a time, and there are many instances where men, who have proved their special adaptability for the work, have been returned for successive terms to the best interest of the regulatory system. There is an unwritten obligation that the governor maintain a commission divided as to party affiliations so that it may act entirely in a nonpartisan manner.

Qualifications.—In practically all of the laws, men appointed or elected to commissions are not to have any direct or indirect pecuniary interest in the industries to be regulated, and the requirement is often exacted that the members and employes of the commission are not to engage in any other business or hold any other political office.

The training of the men eligible to the office of commissioner is specified in some of the laws, while in others certain standards have been established by precedent. The men making up a commission should have different qualifications and training. For example one member may be a lawyer, and associated with him may be a business man familiar with railroad and public utility problems, an engineer of broad training and a man familiar with the financial and economic aspect of the regulated industries.

Provision is often made in the law for a secretary or clerk of the commission and for a special attorney.

The Staff of the Commission.—There is a commission staff, the members of which are appointed by the commission, to supplement the work of the commissioners, make investigations of operating conditions, make appraisals, compile data for submission to the commission, and conduct investigations in the field. The staff usually is organized by departments; the engineering department, accounting and statistical departments, and the tariff or rate departments. These are in turn subdivided. The engineering department, for example, is made up of subdivisions presided over by a railroad engineer, electrical engineer, gas engineer and experts in whatever line is included in the commission's jurisdiction.

COMMISSION PROCEDURE.

The commissions are in practically every case free to adopt their own rules and practice of procedure in making investigations and in conducting formal hearings.

The commission need not wait for the presenting of a formal case. Some of the most valuable work of commissions has not been recorded in formal opinions and cases. Especially is this true in the case of small companies who have been required to keep proper accounts, directed to make improvements in operating machinery, and advised in the development of their business under a favorable rate system.

Informal Cases.—A great part of the complaints made to the state commission are handled informally by correspondence and by visits of some member of the commission's staff.

Formal Cases.—Generally speaking, the less like a court the sittings of the commission in formal cases are the better the results. Matters may be brought up which are outside of the original case presented on complaint, petition or application. The scope of the case may be broadened to include parties other than those bringing the case to the commission and the final order of the commission is not necessarily limited to the initial proceedings but may present a full and complete disposition of all matters brought up during the progress of the case. For example, complaint against a rate charged one individual for electric power service may result in a change in schedule for all classes of service by the company involved.

The commission is given power to require the furnishing of records and data considered necessary to the case and has power to summon witnesses similar to the powers of a court in that respect.

Review by Court.—The judgment of the commission as to the proper findings in a case is practically paramount. The commission's decision may be taken to court for review, but the judgment of the court may not be substituted for that of the commission. If the court finds that the commission has exceeded its powers or made a decision contrary to law and tact, the case must be remanded to the commission for modification in accordance with the court's finding. If new and additional evidence is introduced when the case is presented to the court, the case is returned to the commission for consideration of the new evidence.

The finding of the commission is *prima facie* reasonable, and the burden is upon those carrying the case to the court to prove that the commission's finding is otherwise.

SCOPE OF REGULATION.

Without taking up separately the regulation provided for in the different states, it may be said that commission regulation of public utilities includes regulation of rates, service, accounting practice, the issue of securities, and the valuation of public utility properties.

Rates.—In a few of the state laws the commission is given the power to fix maximum rates only, and in Ohio the rates are in the first instance fixed by municipal ordinance subject in all cases to appeal to the state commission. In the large majority of states, however, the commission is charged with the duty of determining reasonable rates, and may order changes in individual rates or may prescribe entire new schedules. In about half of the states where the commission is given the more complete jurisdiction over rates, the rates of municipal utilities are exempt from regulation.

Provision is made for the commission to make valuations and obtain whatever data it may consider necessary to the determination of proper rates.

Rates Fixed by Contract.—When the utility services were first established, the utility companies were left free to make what agreement they could to gain permission to operate and to induce the customers to take the service. Many promises were made to individuals and to communities naming rates for the service, and these promises were often embodied in special contracts between the company and the customers. With the establishment of regulation, the interesting question arose as to whether or not the company should be permitted or required to carry out these original agreements. It has been generally established that these special contracts must be abolished as con-

stituting unjust discrimination, and the reasonable rates adopted by the commission should be generally applied to all customers regardless of whether these special agreements called for a higher rate or a more advantageous rate to the customer than those found by the commission to be reasonable.

Franchise Rates.—Likewise rates fixed by franchise have been changed after investigation by commission. The franchise rates are binding upon the company only until modified by the commission.

Such orders of the commission have been upheld in cases of review by the courts upon the general ground that the state's power to regulate in cases affected with public interest cannot be bargained away by such special agreements.

Increases above rates fixed by franchise are allowed as well as decreases in such rates, since this is only just to the company, and rate increases may be as much in public interest as rate decreases.

Publicity in Rates.—All rate schedules are to be filed with the commission and all changes in such schedules are to be filed prior to their going into effect. Duplicate schedules and rate changes are to be filed in a place and manner readily accessible to the public. Such provisions securing publicity of rates are made in the interest of elimination of discrimination.

Different rates may be prescribed for different classes of service, but all customers whose service comes under a certain class are entitled to the same rates, rules and regulations.

Modification in rates.—Rates once determined by the commission may be reviewed at any time, either on the commission's own motion or upon complaint of either the company or the customer.

Emergency Rates.—Flexibility of rate regulation was secured by special provision in some of the laws permitting the commission to fix rates in an emergency without recourse to the extended investigation made in usual cases and the advance notice to the public of the proposed increase. Emergency increases have been resorted to in many cases under such provisions to meet the unprecedented increase in operating costs attendant upon war conditions.

Service.—The regulation of the service of public utilities is one of the most important branches of regulation.

Standards of Service.—In the case of gas and electric services, commissions have quite generally worked out statewide standards of service, covering, in the case of electric companies, such matters as accuracy of meters, meter tests, voltage regulation, variations in frequency; and in the case of gas companies, meter accuracy, heating value and illuminating value of gas, tests for purity of product and maintenance of uniform pressure. In some states following the establishment of such rules, regular inspections are made by the engineers in the gas and electric departments of the commission and the companies are required to keep operating records affording a check upon their operation under the standards set by the commission.

Other rules have been adopted covering the method and manner of construction of electric transmission lines, crossing of power lines, street car and railroad crossings, prescribing the intervals of service on car lines and frequency of car stops, regulating telephone and water service and many other matters affecting the safety and adequacy of service in these various utilities.

Extension of Service.—The commission has power to determine what extensions of service are necessary, and when the cost of such extensions should be borne by the company. In some cases the commission has required extensions to be made only upon condition that part or all of the cost be borne by the customers to be served from the extension or only upon such customers guaranteeing a specified return upon the company's investment in the extension.

Joint Service.—The supervision of service covers the rendering of joint service by utility companies. The companies may be required to co-operate in rendering joint service to the public and the compensation for such service may be divided between the companies on a basis determined by the commission.

Refusal of Service.—Public utilities cannot arbitrarily refuse to serve certain customers, but must render service without discrimination. If an application for service is refused by a company it must be in accordance with rules on file with the commission and meeting with its approval. Upon complaint of the applicant to the commission, a determination will be made as to whether or not service should be given in that particular case.

Abandonment of Service.—A utility once having undertaken a service to the public, cannot abandon that service without approval by the commission after proper cause has been shown.

Neither can public utilities change hands by transfer or lease without commission approval; and reorganization and mergers are also made under commission supervision, the theory being that the public is an interested party to all such proceedings to the extent of determining that no unnecessary financial burdens are placed on the public service and that those acquiring control of the property are competent to conduct it in such manner as to afford adequate service to the public.

Accounting.—Commissions have been given the power to establish uniform systems of accounts for all utilities subject to regulation and to require regular company reports.

The information thus on file in the commission's office is of use in capitalization and rate cases and, being uniform, these accounts afford valuable sources of comparisons between operating companies. Complete accounting records for a number of years may afford a better basis for rate making than a valuation prepared for the immediate purpose at great expenditure of time and labor. Such data have been used in regular rate cases as well as in many of the recent emergency increase cases.

Issue of Securities.—The public utility laws vest in the commission power to regulate capitalization, varying from a general provision stating that no public utility should issue securities without the commission's approval, to an elaboration of the commission's power until regulation affords a practical guarantee that there is a property value upon which the company is entitled to a return for all securities issued.

The continued regulation of capital expenditures by the same body regulating rates makes it possible to use the capitalization as a rate base. The company is assured before making an expenditure that it will meet the commission's approval and that it is such that it should be allowed to earn a return upon the amount expended. In the past, companies have made expenditures which have not been justified by future developments. Extensions have been made which never have been profitable and perhaps never will be, and plants have been enlarged to an extent not justified by the later growth of the town. But if these expenditures had been approved by a commission, the

judgment of the company at the time having appeared reasonable to the commission, there would be less opportunity to penalize the company in a future rate case on the ground that poor judgment had been shown in the expenditures which proved to be unnecessarily high.

Valuations.—Appraisals of public utility property may be made by the commission in capitalization and rate cases. In most laws where valuations are mentioned it is left optional with the commission to determine what and when valuations will be made. In one or two laws where it was made mandatory upon the commission to value all public utility property it was found to be practically impossible to determine a basis for such general valuations and it proved to be an unjustifiable burden and expense upon the commission and the utilities.

In some of the states, the staff of engineers organized by the commission has made property valuations for purposes of taxation.

Valuation, especially as concerned in rate cases, is later treated at length in the last two articles of this series as the subject most closely related to the discussion of rates.

Protection From Competition.—The companies most generally subjected to regulation are those in which competition increases the cost of service and is otherwise undesirable. Electric, gas, telephone, water and railway companies are called natural monopolies, because it is possible to have competition only at the expense of running duplicate systems of wires, mains and tracks through the city's streets, as well as maintaining greater plant capacities than otherwise necessary. Regulation by competition is secured by duplication of expenses in other industries, but the objections to duplication in the case of natural monopolies are more obvious. There is absolutely no excuse for duplication of expense under commission regulation.

Before the establishment of commission regulation, municipalities often followed the policy of granting franchises to as many companies as applied, thinking to secure the benefit of low prices during the rate war which invariably followed the establishment of duplicate properties, but the resulting waste, unwise expenditure, and failure to earn an adequate return resulted in the elimination of the weaker competitors or led to a general price agreement, and the price of the service had to be high enough to retrieve the losses during the rate war. Measures to prevent this state of affairs under regulation have been incorporated in many of the state laws. Companies desiring to establish new plants or established companies desiring to extend their service into new fields are required to first obtain a certificate of convenience and necessity from the regulating commission; and practically without exception the disadvantages of duplication have been recognized by the commission and the certificate of convenience and necessity has been withheld when the territory in question is already served by another company.

With one company in the field, if the service is inadequate the commission may order it improved, and if the rates are unreasonable new rates may be prescribed by the commission, leaving no excuse for resorting to the old unsatisfactory method of regulation by competition.

The greater stability given investment in a public utility under protection from competition makes it just that much easier to secure necessary capital for the development of these utilities and is reflected in a lower cost of capital. This protection should be against the establishment of municipal utilities as well as private utilities.

Municipal Utilities.—In about half of the states having regulation of utilities, municipal utilities are subject to the same regulation as private companies under the law. Regulation of the municipal utilities in these states has shown that they are greatly in need of revision of their accounting practice (in many cases the utility accounts are confused with the other municipal accounts until it is impossible to tell what the costs of the utility service are), revision of rates to eliminate discriminations and to afford a proper system for developing the business, and supervision of operation requiring improvements in equipment and operating conditions.

Only in those states placing municipal and private utilities upon the same basis can fair comparisons be made between municipal and private ownership and operation of utilities.

Indeterminate Permit.—In the case of the short-term franchise, capital is secured under the uncertainty as to what will happen when the franchise expires. Capital is under the practical necessity of getting what compensation it can within the term designated in the franchise, often at the expense of quality of the service rendered and upkeep of its property.

Bargaining for renewal of the franchise is often drawn out over a period of years and is a disturbing factor in local politics and company enterprise.

Under proper state regulation there appears to be no reason for continuing the term franchise. Grants to operate indefinitely do not prejudice public welfare as long as regulation requires adequate service at reasonable rates with power to enforce all reasonable requirements in public interest.

In Massachusetts the term franchise was abandoned for what were termed "grants of location," which were in fact franchises granted for an indefinite period during good behavior. Indeterminate-franchise forms have been adopted by the Federal Government: for example, franchises granted by Congress to public service companies operating in the District of Columbia, Porto Rico and the Philippine Islands. The indeterminate-permit provision was written into the Wisconsin law and has proved satisfactory to the companies and the public. In that state all franchises were arbitrarily made indeterminate by law in 1911. Indiana adopted the indeterminate-permit provision, leaving the acceptance of the indeterminate permit optional with the utilities. Commissioners in both states have publicly pointed out the advantages of the indeterminate permit.

Holding Companies.—Under proper regulation, all possible benefits to be derived from the organization of public utility holding companies may be secured without fear of the abuse of their power as against public interest.

Among the advantages to be gained from the holding company is the aid in securing capital for the further development of the subsidiary properties, in securing managing ability to advise in the development of the local enterprises, in building up better accounting practice and in the furnishing of legal and engineering advice from a central office. The expense of furnishing such services is shared by all the subsidiaries, and the pooling of the various risks and hazards makes it easier to secure necessary capital through the central holding company than by the local companies at a similar expenditure of time and money.

With the financial transactions subject to commis-

sion regulation, the accounts of the local companies open to public inspection, the service and rates regulated by the commission, the public interest is protected in the cases where holding companies are involved the same as in any other instances.

Consolidation.—Similarly, combinations of public utilities under regulation are not against public welfare. In fact, combination of business under these conditions is attended with the benefits of economic operation without fear of monopolistic power to be used against the public. The consolidations are under commission supervision as to capitalization, reliability of parties and similar matters of public interest; and after the consolidation has been effected regulation is still just as efficient, not being dependent upon the maintenance of competition. The consolidation of electric utilities, for example, results in more economical operation because the load is more uniform and the reserve maintained at one consolidated plant is not as great as the sum of the reserves necessary in separate plants. The desirability of effecting this saving in electric utility operation has been most marked under the shortage of coal and other war conditions.

The Massachusetts Gas and Electric Commissioners in their thirty-third annual report included in their recommendations for legislation the following request for an extension of their powers to make it possible to order consolidations that would be in public interest:

"Considerable progress has been made by the companies in tying together the electric generating stations, but in a great national emergency a matter so vital to the public interest should not rest entirely on the initiative of the companies. What has been said of power plants applies with equal force to gas works. With a view to prevent unnecessary duplication of investment and to conserve natural fuel resources, the Board recommends that it be given authority, after proper proceedings, to require the physical connection of power stations and gas works, the supply of gas or electric energy to other companies and municipal lighting plants, and the shutting down of such power plants and gas works as may be unnecessary, upon such terms and for such periods as may be just and reasonable, and to exercise the right of eminent domain wherever essential to this end."

Such a law was passed by the Legislature in accordance with the Board's suggestion as Chapter 152 of the General Acts of the year 1918.

Interconnection of electric systems, the pooling of electric power, and its distribution under the direction of a power administrator were secured in other states by the co-operation of the companies and under the direction of the state commissions and the Federal authorities, the aim being to overcome the shortage of power, eliminate wherever possible its uneconomical generation and assure the furnishing of adequate power for the essential industries.

(To be continued.)

STORAGE-BATTERY LOCOMOTIVES IN MINES DISPLACE TROLLEYS.

Examples of Efficient Use of Battery Locomotives in Idaho Mine and of Battery Lumber Carriers in Washington Lumber Mills.

It is of interest to make note of the tendency in coal and metal mines to use storage-battery locomotives instead of those equipped for trolley lines for underground and yard haulage. Some good examples of this means of ore transportation may be observed in numerous deep mines in the West.

The two illustrations presented herewith are from photographs taken on the deep levels in the Bunker Hill & Sullivan lead-silver mine at Kellogg, Idaho. Fig. 1 shows a battery-charging station on the 1100-ft. level, where Edison storage-battery cells are being charged for a Jeffrey 2½-ton locomotive. In Fig. 2

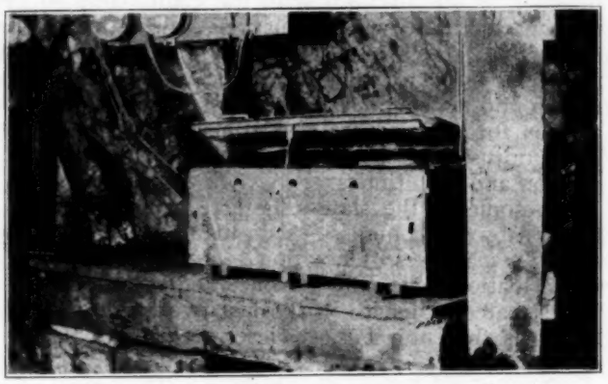


Fig. 1.—Simple Charging Station in Deep Mine for Charging Storage Batteries for Mining Locomotives.

is shown a charging and watering station on the 1300-ft. level of that mine, where a General Electric 3½-ton locomotive with Edison batteries is being charged.

In operating under this system, one favorable feature is that the batteries may be charged at times of the off-peak load, and of course the elimination of trolley wires counts for greater safety and economy of installation and maintenance costs. The number of loaded mine cars that may be pulled by a storage-battery locomotive of a given capacity depends, as in other cases, upon the condition and grade of the tracks and weight of ore per cubic yard. Some mine haulage locomotives having storage-battery equipment have as great as 9 tons capacity. Six or seven locomotives of

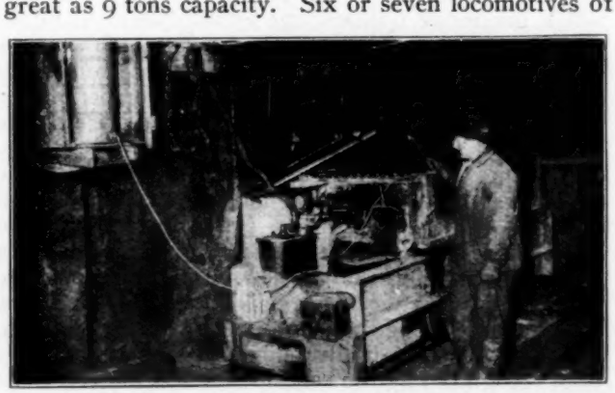


Fig. 2.—Charging and Watering Station on 13th Level of an Idaho Mine—A 3½-ton Battery Locomotive Is Being Charged.

this class, of various makes and capacities, are used in the Bunker Hill & Sullivan mine.

A similar tendency to use battery tractive equipment is observed in looking over the lumber mills of the Pacific Northwest. For instance, in the Grays Harbor region in the state of Washington there are 14 Foss electric lumber carriers, operated by storage batteries, in use. Many of these are equipped with Edison cells, giving each carrier a storage capacity of 18 kw-hrs.

Interesting Examples of Graphic Meter Records

What Graphic Records Signify—Superiority of Graphics Over Other Forms — Typical Instances of Graphics

GRAPHICS visualize a fact. Columns of figures may state a fact; but it takes a curve, a graph or a diagram to interpret the figures, to bring home just what the figures signify. Graphics tell the tale.

Electricity often offers the most convenient and often the most accurate method of measuring energy, speed, temperature and motion. And it is the recording instrument that enables the metering to be visualized by graphic registration. It has often been said that the electrical graphic recording instrument is the efficiency engineer of the industrial plant, because it shows what is being done, what conditions change, when they change and enable the cause of the change to be discovered.

In some instances it is practically out of the question to make a determination unless the electrical measuring instrument—and almost invariably this means the graphic recording instrument—is employed. For example, it would be very difficult, extremely laborious and quite costly to determine unless electrically just at what rate the output of a machine shop drops off as the lunch hour aproaches, whether work is resumed promptly when the whistle blows again, and whether the individual machines are kept busily employed until the time to stop arrives. The electric recording graphic meter shows just what happens, every instant of the time, when machines are started and stopped, when a machine runs idle for a bluff, when a machinist takes a light cut instead of a heavy one, and so forth. In the steel mill, the graphic instrument accomplishes the same purpose, it visualizes conditions, shows when something happens, shows the effect of changed operating conditions, indicates what ought to be done.

The applications of the graphic meter, for measuring current, voltage, energy, power-factor, speed, temperature and so on are endless. Not long ago in these columns it was shown where an industrial plant had been able by the use of a graphic wattmeter to purchase additional power from the central station instead of building additional plant of its own by simply modifying slightly the method of operating A few days ago an instance came to our knowledge where by the use of a recording ammeter, it had been possible to redesign a large machine in a steel mill and thereby brought about considerable operating economy. Such instances are legion.

The pictorial history of a heat in an electric furnace melting steel is shown in Fig. 1. The furnace is of the Heroult arc type, and takes a charge of 3000 lbs. of steel for producing nickel steel. The charge was fed to the furnace without preheating. At the start, the power taken by the furnace is small, but as the resistance of the furnace circuit constituted by the steel decreases as the electrodes heat up and the charge consolidates the current increases until stable conditions are obtained. The excessive variations are due to individual pieces of metal falling between the electrodes and causing what is in effect a short circuit. These short circuits are, of course, only temporary and result from movement of metal under the heavy current rush across it. The gradual lowering of current toward the end of the run was for the special treatment given the nickel-steel.

In following the records of a graphic meter in connection with electric furnaces, it is possible to know almost exactly when the heat will be ready for pouring, when various constituents should be added, as zinc to the brass furnace, and so forth.

Figs. 2 and 3 show respectively the load curves of two metal-working plants engaged in automobile finished parts production, the former working upon the day system, the latter on the bonus system. In most metal-working plants the power input varies with the output in finished parts. Fig. 2 shows that

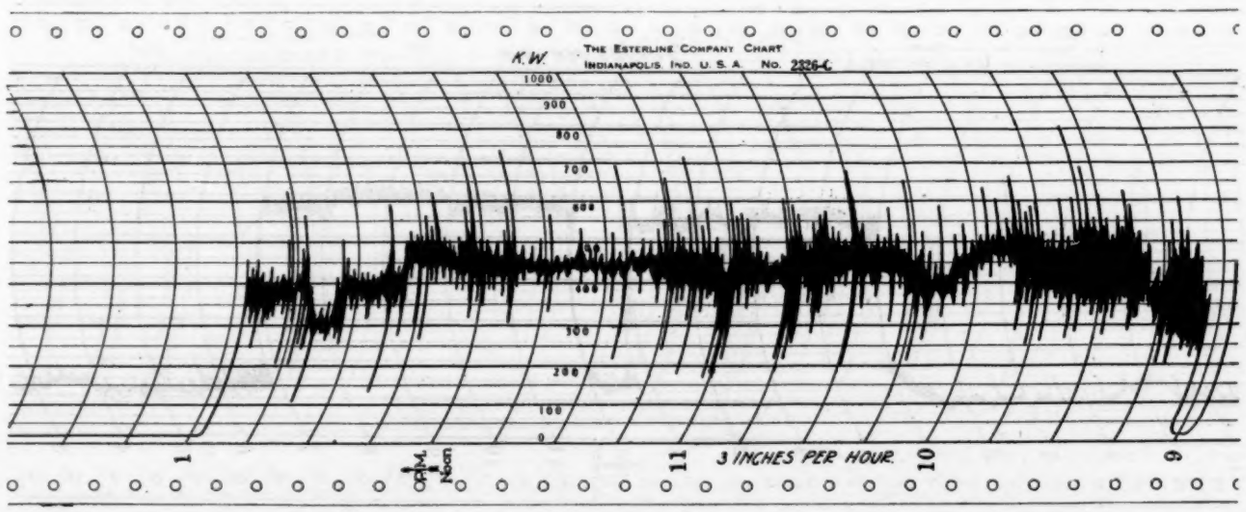


Fig. 1.

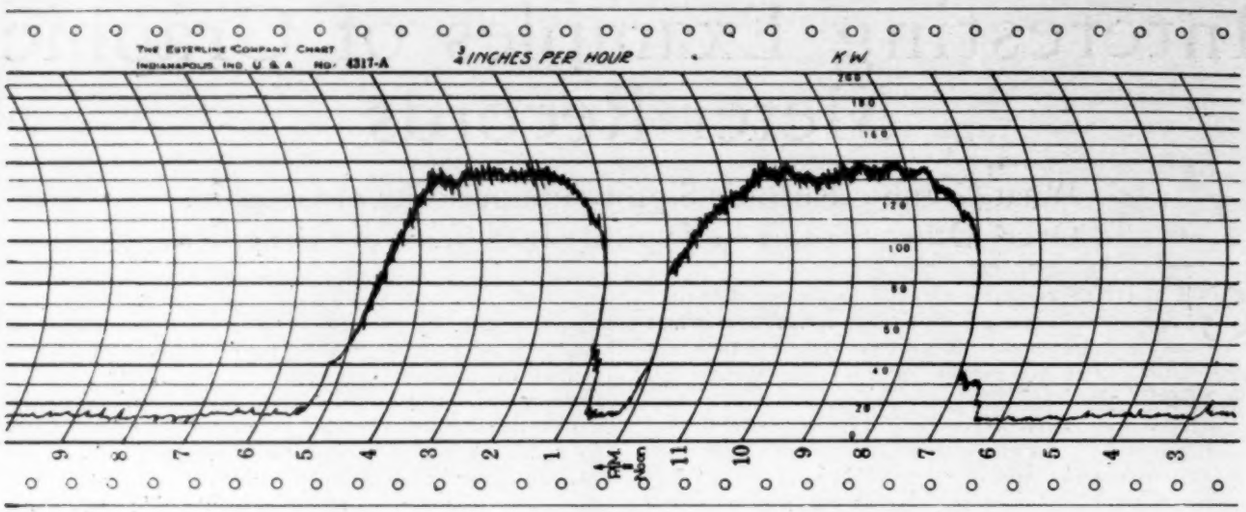


Fig. 2.

it took 45 minutes for the men to get the production up to normal in the morning and that the noon hour was anticipated by approximately 1½ hrs. probably given over to washing hands, preparing lunch, buying from peddlers, etc. Forty-five minutes were required too for the men to get production up to normal after the noon recess and then falling off commenced to occur about 1½ hours before quitting time.

In contrast is Fig. 3, which shows the load curve in a similar plant, but with the workers paid on the bonus system. Here the production commences directly the whistle blows and the rate of production is maintained right up to the noon hour. Work starts immediately when the lunch hour is over, with production slightly lower during the afternoon (chargeable to human fatigue rather than slackening such as is prone to occur when there is no special incentive to maintain the pace) and continues steadily without let-up till quitting time. These two records, when properly interpreted and studied, might result in a saving of many thousands of dollars to a concern paying its workers according to time instead of according to production.

Power-factor is the ban of many a central-station company. It interferes with voltage regulation; it limits the current-carrying capacity of generator fields, of underground and overhead lines and makes itself objectionable in many other ways. The graphic record of power-factor as obtained by one central station shows in an illuminating manner the value of the graphic recording meter for making surveys and getting to the root of a problem. Low power-factor was existent and a synchronous condenser was installed in one of the customers' plants to remedy conditions.

The size and necessity for a synchronous condenser were determined by surveys with graphic recording instruments, and these were later used to determine the correctness of the diagnosis and degree of solution. The record covers the period from 4:45 a. m. to 9:30 a. m. The power-factor is about 85% during the night, rising to 87% as the morning lighting load comes on. At 6:30 a. m. it begins to drop rapidly as induction motors are started and reaches 57% at 7:00 a. m., and would probably range about 60% throughout the day if no corrective apparatus were used. At 7:05 the synchronous machine is started, which, when the field is properly adjusted, maintains a power-factor of about 95% throughout the day. These facts are well visualized in the record shown on page 981, Fig. 4.

The electric elevator is overcoming competition with elevators of the hydraulic type in the large cities where high water pressure is available. They are without competition in the smaller cities where the

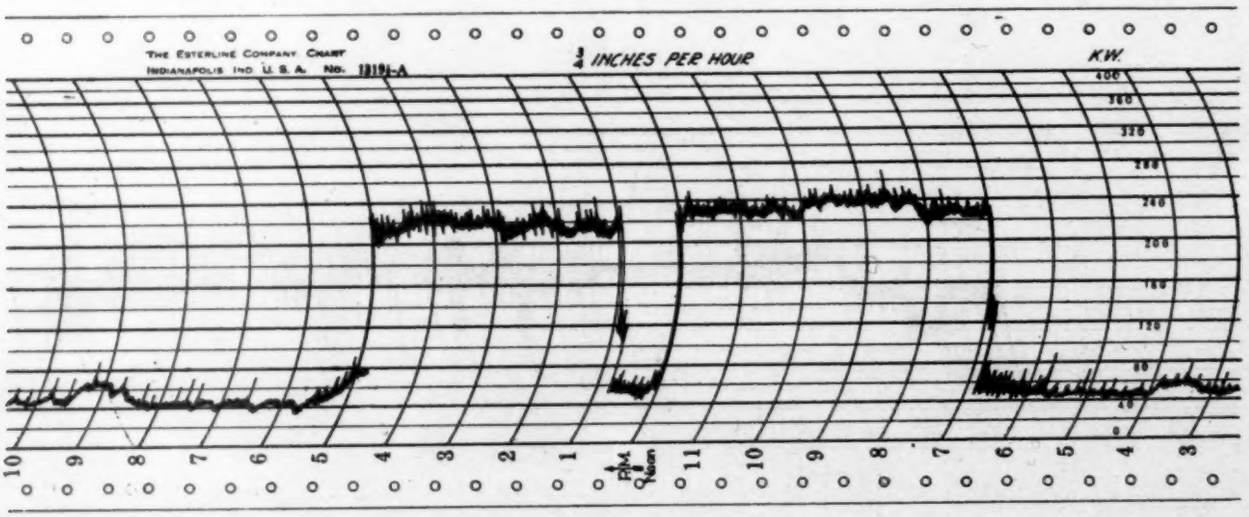


Fig. 3.

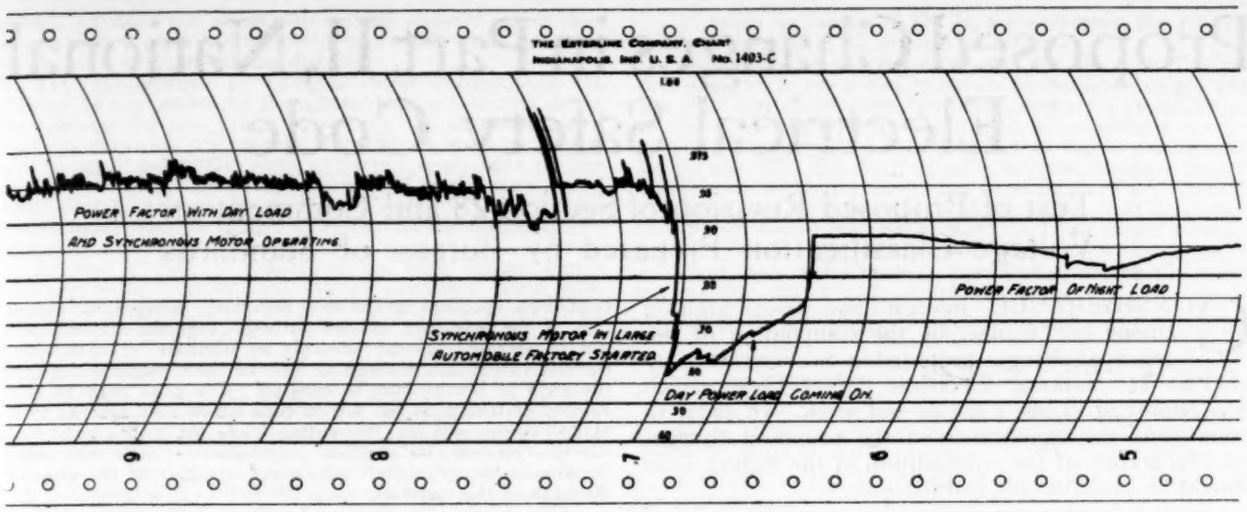

THE ESTERLINE COMPANY, CHART
INDIANAPOLIS, IND. U. S. A. No. 1403-C
POWER FACTOR WITH DAY LOAD
AND SYNCHRONOUS MOTOR OPERATING
SYNCHRONOUS MOTOR IN LARGE
AUTOMOBILE FACTORY STARTED
DAY POWER LOAD COMING ON
POWER FACTOR OF NIGHT LOAD

Fig. 4.

hydraulic elevator is not utilized. The amount of weight used for the counterweight is an important factor in operating economy and starting demand and this factor becomes of great importance where a number of elevators are used and where power is purchased upon a basis of kilowatt-hours consumed and kilovolt-amperes or kilowatts demand.

The graphic record shown in Fig. 5 shows the performance of an electric passenger elevator operated by a 25-hp., 220-volt, 60-r.p.m. direct-current motor. This elevator was tested running light, and the effect of the counterweight is clearly shown, the power requirements when running down being considerably greater than the power required to raise the cage. The operation of the automatic controlling equipment as well as the regeneration when braking is clearly shown. Records of this kind are useful to determine the condition of the elevator equipment, the handling by the operator and to secure data necessary for the correct scheduling of the cars.

The graphic records shown have been presented as being merely typical of what the electric graphic recording instrument enables to be done.

Similar applications could be discussed to much greater length. Sufficient has been said, however, to emphasize once more the value of the recording graphic instrument.

CREDITABLE PERFORMANCE OF STAND-BY STORAGE BATTERY.

A 150-cell, 1000-kw. storage battery installed in Station 6, Rochester Railway & Light Co., in 1905, has just been taken out of service to be sold as junk, it having completed its term of useful life of fourteen years since installed in 1905 by the Electric Storage Battery Co.

The function of the battery was to maintain continuity of service of the company's Edison system during such times of accidental interruption which would otherwise have occurred. A further use was to help out generating apparatus, transforming apparatus and underground lines, during periods of peak and excessive load. During its lifetime of fourteen years the battery furnished 1,844,803 kw-hrs., every one of which served a very useful purpose and often prevented a serious predicament from arising.

It might be pointed out that central stations are now recognizing that a storage battery is too valuable to be used for assisting over the peak load except under exceptional circumstances. When used for standby service only, which is the condition existing invariably today, a battery should have a life exceeding the one mentioned above, namely fourteen years. Obviously such an investment is a sound one.

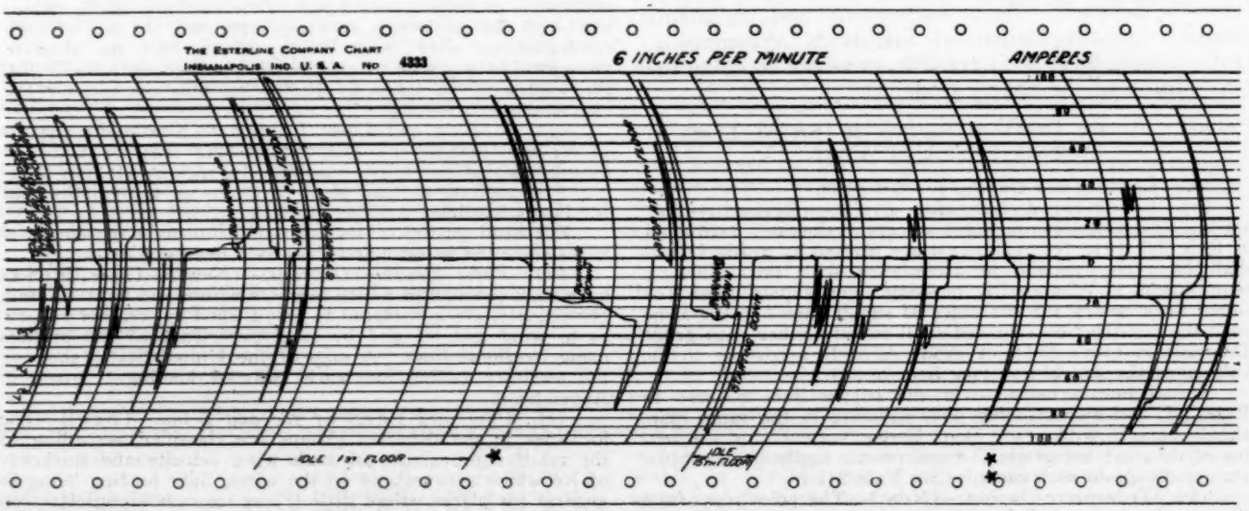


Fig. 5.

Proposed Changes in Part II, National Electrical Safety Code

Text of Proposed Revision of Section 28 and Comment on Voltage Classification Prepared by Bureau of Standards

CONSIDERABLE interest has been aroused among our readers by the compilation of the principal changes proposed in Sections 20 to 27 of Part II, National Electrical Safety Code, which was published in our issue of last week. In order to understand the significance of the proposed changes readily, a copy of the 1916 edition of the Safety Code should be available for comparison.

Such a comparison shows that rearrangement of the order of the rules has been carried out very extensively; this at first is confusing, but the old numbers of the rules given in the parentheses are a useful guide. The Bureau of Standards has prepared a table of contents of Part II, giving both old and new numbers. This gives a comprehensive view of the grouping of the rules in the present draft and will facilitate finding the location of any specific rule of the old edition. In contrast to the general opinion, some of the proposed rules are more lenient than the old ones.

On account of the numerous changes made in Section 28, the proposed complete revised text of it is given below, following generally the method used last week in presenting the principal changes in Sections 20 to 27, inclusive. In Section 29, on the contrary, only one minor change is proposed, so this section is omitted.

A discussion of the new voltage classification proposed is appended. This was prepared by Dr. E. B. Rosa, chief physicist of the Bureau of Standards, and explains why this classification is to be changed and how it will affect different types of circuits. Supplementing Part II in the new edition of the Code will be much similar explanatory matter making clear the reasons for many of the rules and interpreting them where there is possibility for not grasping their real significance.

The Bureau courts comments and constructive criticisms of the proposed changes before these are formally adopted. Such suggestions and comments should reach the Bureau of Standards, Washington, D. C., before Dec. 26 if possible so as not to delay the new edition of the Safety Code.

PROPOSED REVISED DRAFT OF SECTION 28—SIGNAL LINES AT CROSSINGS AND USED ALONE.

280. Loading and Guying for Grade D.

(*a*) *Conditions Determining Grade.*—(Revised.)—Signal lines crossing over railways, except in the cases mentioned in Rule 235 (*b*), (*c*), (*d*), (*e*), are classed as grade D and shall have construction in accordance with the following requirements. Where also crossing over supply lines (or signal lines having the character of supply lines) in the same span the construction required shall comply either with grade D, grade E (Rule 284), or grade A or B, according to the voltage of the supply line (see Section 23).

Signal lines crossing over the supply lines covered in Rule 234, and also crossing over railways in the same span, should comply with grade D or E requirements for supporting structures; but grade C requirements apply to conductor sizes and sags in such cases. (See Rule 241.)

(*b*) *Transverse Guying.*—(New.)—The poles supporting the crossing span shall be side-guyed or braced to withstand the transverse load put upon them in accordance with the conditions specified in the two following paragraphs, except that, if the poles are of such strength that the material will not be stressed beyond one-half its ultimate strength when the poles have deteriorated to 50% of their original strength, the guys or braces may be omitted. The guys shall be considered as taking, in the direction in which they act, the horizontal component of the entire load, the poles, acting as struts, resisting the vertical component. The calculated stresses in the guys shall not exceed one-half of the ultimate strength of the material.

(*c*) *Heavy Transverse Loading.*—(New.)—In regions of heavy loading the assumed horizontal wind pressure at right angles to the direction of the line upon the poles and conductors shall be taken as 8 lbs. per sq. ft. of projected area on cylindrical surfaces. The pressure shall be computed upon the poles without ice covering, while the conductors shall be assumed to be covered with a layer of ice one-half inch in radial thickness. In computing the transverse pressure on conductors the actual number of conductors shall be used up to 10. For larger number of wires only two-thirds of the total number shall be counted, with a minimum of 10.

(*d*) *Medium and Light Loading.*—(New.)—In regions of medium loading the transverse wind pressure shall be taken as two-thirds that for heavy loading. In regions of light loading the transverse wind pressure shall be taken as four-ninths that for heavy loading. (See (*h*) below as to three loading districts.)

(From 280*e*.)—In calculating transverse load, a cable with its supporting messenger shall be considered equivalent to the number of open wires obtained by multiplying the diameter of the cable in inches by three.

(*e*) *Longitudinal Guying.*—(New.)—The poles supporting the crossing span shall be head-guyed away from the crossing so as to withstand the load specified in the two following paragraphs, except that, where there are not more than two wires in a crossing span and the poles are not required by (*b*) to have side guys, the head guys may be omitted, if the poles are of such strength that the material will not be stressed beyond its ultimate strength when the poles have deteriorated to 50% of their original strength. The guys shall be considered as taking, in the direction in which they act, the horizontal component of the entire load, the poles, acting as struts, resisting the vertical component. The calculated stresses in the guys shall not exceed the ultimate strength of the material.

(*f*) *Heavy Longitudinal Loading.*—(New.)—In regions of heavy loading the longitudinal load shall be assumed equivalent to an unbalanced pull in the direction of the crossing of all the conductors or wires supported, the pull of each conductor or wire being taken as one-half its ultimate strength. In any case where the total pull exceeds 10,000 lbs. the load shall be taken as 10,000 lbs. plus one-quarter the excess above 10,000 lbs.

(*g*) *Medium and Light Loading.*—(New.)—In regions of medium loading the longitudinal load shall be taken as two-thirds that for heavy loading. In regions of light loading the longitudinal load shall be taken as four-ninths that for heavy loading.

For head guying cables are not included in the count of wires since the messenger serves as a head guy.

(*h*) *Three Loading Districts.*—(New.)—Three districts have been outlined in which heavy, medium and light loading, respectively, are considered to be justified by weather reports as to wind and ice and by local experience of the utilities using overhead lines. A map of the United States showing the territory falling into each class of loading is given in Appendix A.

(*i*) *Combined Effect of Ice and Wind.*—(New.)—The localities in the different groups are classified according to the relative prevalence of high wind velocity and thickness of ice which accumulates on the wires, light loading being in general for places where little if any ice ever accumulates on wire. If high wind velocities are frequent in a given place the loading for that place may be classed as heavy even

though ice does not accumulate to any greater extent than at some other place having less severe winds which has been classed as a medium-loading district.

(*j*) *Modification of Loading Areas.*—(New.)—In the absence of any action by the administrative authority fixing the loadings for any given jurisdiction the classification of loadings shown on the map in Appendix A shall be considered to apply unless the party or parties responsible for the lines concerned assume some modification of the same, based upon local experience or weather records, or both. These modifications shall be subject to review by the administrative authority.

In case a state is redistricted by state administrative authority, so as to meet local weather conditions better than the map of Appendix A, a grade of loading above heavy may be used, if necessary to meet such local conditions.

(*k*) *Guy Leads.*—(280 *f.*)—Guy anchors shall, where possible, be located so that the horizontal distance from the ground line of the pole to the guy or guy rod will be not less than the height above ground of the attachment of the guy to the poles for head guys, and not less than one-third that height for side guys. The guys shall be attached as near to the center of the load as practicable. The guys and anchors shall be maintained so that the guys are kept taut and serve the purpose for which they are intended.

281. Poles, Crossarms and Wires for Grade D.

(*a*) *Size of Pole and Setting.*—(280 *d.*)—Wood poles supporting the crossing span shall be of selected timber, sound and reasonably straight. Poles shall have dimensions not smaller than the values given in the tables of Appendix B when carrying the numbers of wires there designated.

(New.)—The minimum dimensions given in the table of Appendix B correspond to poles designated by the wire-owning companies as class C, where less than 20 wires are carried; class B, where 20 to 40 wires are carried; class A, where more than 40 wires are carried.

(New.)—Poles shall be set to such a depth and in such a manner and back filling shall be tamped so thoroughly that the applied load will break the pole before the butt is pulled loose in its setting.

A table of recommended depths of setting is given in Appendix B.

(*b*) *Crossarms.*—(280 *h.*)—Wood crossarms supporting the crossing span shall be of yellow pine, fir or other suitable timber and shall have a minimum section of 2¾ by ¾ ins. for 6-ft. arms or shorter and 3 by 4 ins. for arms longer than 6 ft. Galvanized or painted iron or steel crossarms of equal strength may be used.

In rural districts in arid regions where the practice has been established by using 2¾ by 3¾-in. arms in 8 and 10-pin lengths, this practice may be continued where conductors are not larger than No. 10.

Crossarms and insulators shall be double on the crossing poles. The crossarms shall be held together with properly fitted spacing blocks or bolts placed immediately adjoining the outside pins and shall not support more than 10 conductors. Brackets or racks may be used only if used in duplicate or otherwise designed so as to afford two points of support for each conductor, except that for supporting twisted-pair wires, a single metal bracket, designed to safely withstand the full dead-end pull of the wires, may be used.

(*c*) *Pins, Insulators and Tie Wires.*—(280 *i.*)—Insulator pins shall be of steel, wrought iron, malleable cast iron, or locust or equivalent wood. Wood pins shall be sound and straight-grained with a minimum diameter of shank of 1¼ ins. and a maximum length of 8¾ ins. Steel or iron pins shall have a minimum diameter of shank of ½ in. and a maximum length of 9¼ ins.

(280 *j.*)—Each insulator shall be of such pattern, design and material that when mounted it will withstand, without injury and without being pulled off the pin, the ultimate strength of the conductor attached to the insulator. The conductors shall be securely tied to each supporting insulator.

(*d*) *Conductors.*—(280 *k.*)—Conductors shall be of hard-drawn copper, copper-covered steel, galvanized steel or other hard-drawn, corrosion-resisting metal, provided, however, that galvanized steel shall not be used in localities where excessive corrosion would result.

The minimum allowable sizes for conductors of the crossing span are given in the following table:

TABLE 13.—MINIMUM WIRE SIZES FOR GRADE D.

Conductor.	Spans 125 ft. or less.	Spans over 125 ft. up to 150 ft.
Hard-drawn copper	No. 10 A. W. G.	No. 9 A. W. G.
Galvanized steel	No. 10 Stl. W. G.	No. 8 Stl. W. G.
Galvanized steel in rural districts of arid regions	No. 12 Stl. W. G.	No. 8 Stl. W. G.
Steel-reinforced aluminum	No. 6 A. W. G.	No. 6 A. W. G.

If spans in excess of 150 ft. are necessary, the size of conductors specified above shall be increased.

Conductors of material other than the above shall be of such size and so erected as to have a mechanical strength not less than that of the sizes of copper conductors given above.

(280 *l.*)—The use of twisted-paid wires without a supporting messenger shall be eliminated as far as practicable. In no case shall this kind of wire be used in spans longer than 100 ft. without a supporting messenger. Each wire of a twisted pair not supported by a messenger shall be tinned hard-drawn copper not smaller than No. 14, or tinned copper-covered steel not smaller than No. 17.

Conductors of the crossing span shall be strung with sags not less than shown in the following table:

TABLE 14.—SAGS OF HARD-DRAWN BARE COPPER WIRE OR STEEL.

Length of span.	Sag in inches At 20° F.	At 60° F.	At 100° F.
No. 10 or larger—			
80 ft.	2½	4½	8½
90 ft.	3½	5½	10
100 ft.	4½	7	12
110 ft.	5½	8½	14
120 ft.	6½	10	16
No. 9 or larger—			
130 ft.	9	12	21
140 ft.	10	15	22
150 ft.	12	18	25

(*e*) *Messengers.*—(280 *n.*)—The following table gives the minimum sizes of galvanized steel strand messenger cable to be used for supporting different sizes of cable:

TABLE 15.—MINIMUM SIZES OF MESSENGER CABLE.

Size of cable in weight per foot.	Messenger cable (nominal ultimate tensile strength).
Less than 2.25 lbs.	6,000 lbs.
2.25 to 4.5 lbs.	10,000 lbs.
Over 4.5 and under 7.25 lbs.	16,000 lbs.

For spans exceeding 150 ft. or for heavier cables a proportionately larger messenger cable or other proportionately stronger means of support shall be used.

Multiple-wire cables and their messengers shall be suspended with a normal sag at 60 deg. F. not less than given in the following table:

TABLE 16.—MINIMUM SAGS OF MESSENGER CABLES.

Length of span.	Sag.
80 ft.	11 in.
90 ft.	13 in.
100 ft.	17 in.
110 ft.	20 in.
120 ft.	24 in.
130 ft.	28 in.
140 ft.	33 in.
150 ft.	37 in.

282. Signal-Line Clearances.

(*a*) *Clearances from Ground.*—(280 *c.*)—The clear space between the lowest signal conductor, guy or messenger and the heads of rails shall, at 60 deg. F. with no wind, be in general not less than 27 ft.

When the signal conductors are paralleled on the same highway by a trolley contact conductor at a lower level, the clearance of the signal conductors from the rail may be reduced to 25 ft.

When signal conductors cross tracks not carrying traffic which involves brakemen riding on top of standard freight cars, the above clearance may be reduced to 18 ft.

When spans exceed 150 ft. in length, additional clearance must be provided as given by Rule 220 *a.*

(*b*) *Clearances from Other Wires.*—(280 *c.*)—The clear space between the lowest signal conductor, guy or messenger and the highest wire of a similar nature paralleling the track shall be not less than 2 ft. where the span is 100 ft. or less. For longer spans and for crossings over supply wires, the requirements of Rule 220 *b* must be met.

The vertical clearance between conductors supported on the same pole or structure and at different levels shall in no case be less than 12 ins. and preferably 24 ins. (see also Rule 223).

(*c*) *Pole Clearances.*—(280 *a.*)—Unless physical conditions or municipal requirements prevent, the side clearance of poles shall be not less than 12 ft. from the nearest track rail, except at sidings where clearance of not less than 7 ft. may be allowed. Where conductors of one pole line cross over or under conductors of the second line there shall, if practicable, be not less than 3 ft. clearance between the conductors of the first line and any pole or tower of the second line, unless the conductors are attached thereto.

283. Relation of Crossing Span to Line.

(*a*) *Span Length.*—(280 *a.*)—Poles should, where prac-

ticable, be so located that crossing and adjacent spans are in a straight line and free from exposure to overhanging or closely adjacent trees or inflammable material or structures. (See Rule 211 for requirements as to location of poles.)

(280 *b*.)—The crossing span shall be as short as practicable, and in general shall not be longer than the normal span of the line. No crossing span should exceed 125 ft. in length if this can be avoided.

(*b*) *Vertical Displacement of Crossing Span.*—(*New.*)—The vertical distance from the top crossarm of a crossing pole to a straight line connecting the top crossarms of the next adjacent poles on either side of this crossing pole shall not exceed the values given in the following table:

Average length of span in feet.	Allowable vertical distance in feet.
Under 100	4
100 to 130	5
Over 130	6

(*c*) *Guying in Special Cases.*—(280 *g*.)—Where on account of physical conditions it is impracticable to guy or brace the crossing poles as specified in (*b*) and (*c*) the requirements there given may be met by head guying and side guying the line as near as practicable to the crossing, but at a distance not exceeding 500 ft. from the nearest crossing pole, provided that the line is approximately straight and that a cable of strength equivalent to that of the head guy is run between the two guyed poles, being attached to the guyed poles at the point at which the head guys are attached, this cable being securely attached to every pole between the guyed poles.

Where the poles supporting the crossing span are not in line with the poles in the adjoining spans, additional guying shall be placed to take care of the increased stress.

(*d*) *Inspection.*—(*New.*)—All parts of the supporting structures of the crossing span shall be examined annually by the owner and all defective parts shall be promptly restored to a safe condition.

284. Signal Lines Crossing Over Minor Tracks—Grade E.

(*a*) *Grade.*—(281.)—Signal lines crossing above minor tracks (as described in Rule 235 *b*) shall conform to the requirements for grade E. These requirements differ from those of grade D only in the respects specified in (*b*), (*c*) and (*d*) below.

(*b*) *Transverse and Longitudinal Strength.*—(New.)—The transverse and longitudinal strength of crossing supports of grade E construction shall be equivalent to two-thirds of that required for grade D construction by Rule 280.

(*c*) *Size of Pole.*—(281 *a*.)—Poles shall have dimensions not smaller than the values given in the tables of Appendix B when carrying the numbers of wires there designated.

The minimum dimensions given in the tables of Appendix B correspond to poles designated by the wire-owning companies as class C where not more than 40 wires are carried; class B where more than 40 wires are carried.

(*d*) *Conductors.*—(281 *d*.)—The minimum allowable sizes for conductors of the crossing span shall be as follows:

TABLE 17.—MINIMUM WIRE SIZES FOR GRADE E.

Conductor.	Spans 125 ft. or less.	Spans over 125 ft. up to 150 ft.
Hard-drawn copper in heavy loading districts	No. 10 A. W. G.	No. 10 A. W. G.
Hard-drawn copper in medium and light-loading districts	No. 12 A. W. G.	No. 10 A. W. G.
Galvanized steel	No. 12 Stl. W. G.	No. 10 Stl. W. G.
Steel-reinforced aluminum	No. 6 A. W. G.	No. 6 A. W. G.

If spans in excess of 150 ft. are necessary the size of conductors specified above shall be increased.

Conductors of material other than the above shall be of such size and so erected as to have a mechanical strength not less than that of the sizes of copper conductors given above.

The use of twisted-pair wires without supporting messenger shall be confined to spans not exceeding 125 ft.

285. Minimum Sizes of Grade C Signal Conductors.

(New.)—Signal conductors which are required to comply with grade C construction may be smaller than grade C supply conductors but not smaller than given in the following table:

TABLE 18.

Span length and sag.	Material.	Size.
Spans not over 100 ft. with sags not less than 12 ins., and spans over 100 ft. but not over 125 ft. with sags not less than 15 ins.	Hard copper.	10 A. W. G.
	Steel.	12 Stl. W. G.
Spans over 125 ft. but not over 150 ft. with sags not less than 18 ins.	Hard copper.	9 A. W. G.
	Steel.	11 Stl. W. G.
Spans over 150 ft. with sags of grade C supply conductors or more, as given in Appendix A.	Hard copper.	Sizes of grade C supply conductors as given in Rule 246.
	Steel.	

Paragraph 272 *d* does not apply to such conductors.

286. Signal Lines Crossing Over Trolley Contact Conductors.

(*a*) *Not Exceeding 750 Volts.*—(282 *a*.)—(1) Signal lines, except twisted-pair conductors [see (2)] and fire-alarm conductors [see (3)], carried over trolley contact conductors below 750 volts shall have conductor sizes as specified for grade C in Rule 246 and sags as specified for grade C in Appendix A; except that for crossings where grades D or E are not required, for spans not exceeding 100 ft., No. 12 hard-drawn copper or steel is permitted with a sag of not less than 12 ins., for spans between 100 and 125 ft. No. 10 is permitted with a sag not less than 15 ins., and for spans between 125 and 150 ft. No. 9 is permitted with a sag not less than 18 ins.

Where the signal lines concerned cross over railways under circumstances requiring grade D or E construction for signal lines, the requirement of the above rule applies as to size and sag of conductors, while grade D or E applies to the supporting structures.

(2) Twisted-pair conductors, unsupported by messengers, shall not be used in spans over 100 ft., if carried over trolley contact conductors below 750 volts, unless each wire is hard-drawn copper not less than No. 14 or copper-covered steel not less than No. 17.

(3) Fire-alarm conductors shall in no case be smaller than required for grade C signal lines by Rule 285.

(4) The clearance of signal lines above contact conductors crossed over shall be in accordance with the values given in the table of Rule 220 *b*.

(*b*) *Exceeding 750 Volts.*—(282 *b*.)—(1) For signal lines carried over trolley contact conductors above 750 volts to ground see Rule 233.

(2) Twisted-pair conductors may be used under the restrictions given in (*a*) (2) above, but if in A or B construction, they shall have sags not less than those required by Appendix A for No. 8 hard-drawn copper, and where supported by a messenger, the messenger shall have the sags required in Rule 281 *e*. Where supply-line voltage exceeds 7500 volts the twisted pair shall always be supported by a messenger.

(3) The clearances of signal lines above the contact conductors crossed over shall be in accordance with the values given in the table of Rule 220 *b*.

287. Signal Lines Crossing Over or Conflicting With Supply Lines Above 750 Volts (Not Recommended Except Over Trolley Feeders).

(*a*) *Strength of Construction.*—(283 *a*.)—Overhead signal lines crossing over supply lines under the circumstances noted in Rule 233 *e* shall comply with the construction requirements of grade A, B or C as required in that rule. (See Rule 289 for signal lines used in the operation of supply lines.)

(*b*) *Compliance With Other Rules.*—(283 *b*.)—Where signal lines crossing over supply lines are required to comply with grade A, B or C construction, they shall comply as to conductor sizes, materials and sags and as to materials and strength of supporting structures and attachments with Section 24; as to separation and clearances of conductors and wires of the signal lines themselves with the requirements of Section 22; as to guys and their insulators with the requirements of Rules 212 and 213, and in general with the requirements of Sections 20 and 21.

(*c*) *Where Concerned Also With Railways.*—(283 *c*.)—Where the signal lines referred to in (*a*) above are required to comply with grade C construction and also cross over railways under circumstances calling for compliance with grade D or E construction requirements for the signal lines, the requirement for grade C construction may be waived as to strength of supports, being replaced by those of grades D or E, but grade C requirements apply as to size and sag of conductor. (See Rule 285.)

(*d*) *Pole Clearance.*—(283 *d*.)—The pole or tower structures of each line concerned in the crossover shall have clearances from the conductors of the other line as required by Rule 221 or 227, whichever applies.

(*e*) *Wire Clearance Above Supply Lines.*—(283 *e*.)—The clear space between the lowest overhead signal-line conductor (or guy, messenger or span wire) crossing over any supply line conductor or guy, span or messenger wire* shall not be less than given below, at 60 deg. F. with no wind

*Except for crossings between conductors and guy, messenger or span wires on the same pole, for which see Rule 220b.

where the upper conductor or wire has fixed supports, and the sum of the distances from the point of intersection to the nearest supporting structure of each span does not exceed 100 ft.

	Feet.
Signal lines above supply conductors below 7500 volts	4
Above supply conductors 7500 to 50,000 volts	6
Above supply service conductors	2
Above supply guy, messenger, and span wires	2
Guy, span and messenger wires above supply conductors below 750 volts	2
Above supply conductors 750 to 7500 volts	4
Above supply conductors 7500 to 50,000 volts	6

(*f*) *Clearance Increases.*—(Replacing 283 *f* and *g*.)—Clearance increases for long spans and high voltages are given in Rule 220 *b*.

(*g*) *Falling Trees.*—(283 *h*.)—The crossing span and the next adjoining spans, so far as practicable, shall be kept free from overhanging or decayed trees, which might fall into the line. (See also Rules 209 and 220 *d*.)

(*h*.) *Special Longitudinal Requirements.*—(283 *i*.)—For special requirements for longitudinal strength of crossover supports of signal lines crossing over supply lines, where compliance with grade A or B is required for the signal lines, see Rule 249.

(*i*) *Special Short-Span Crossovers.*—(283 *j*.)—For special short-span crossing construction, see Rule 275.

(*j*) *Guys.*—(283 *k*.)—Guys may be used to meet the strength requirements of Section 24 and where used they and their insulators and guards shall conform to Rules 212 and 213

(*k*) *Signal Lines Conflicting With Supply Lines.*—(284 *a*.)—Where signal lines are at higher levels and conflict with supply lines the requirements of (*a*) and (*b*) above apply in general to the conflicting signal lines just as they apply where the signal lines cross over the same supply lines.

Clearances from the poles and conductors of a second line are given in Rule 227.

Requirements for guys are given in Rule 212.

288. Signal Lines Alone (or Concerned Only With Other Signal Lines).

(*a*) *Fire-Alarm Lines.*—Conductors used for fire-alarm circuits shall comply with the requirements of Rule 285 for grade C signal lines.

Where carried at higher levels than supply conductors in crossings, conflicts or common use of poles, they shall comply with grade A, B or C construction requirements according to Rule 233 *e*.

(*b*) *Other Signal Lines.*—Conductors for signal lines other than fire-alarm lines, unless crossing at higher levels or conflicting with, or on the same poles above supply (or trolley) lines, need not comply with any requirements as to size, material or sag.

(*c*) *Supporting Structures for Signal Lines.*—The poles used for other signal lines, unless exposed to supply (or trolley) lines by crossing above, conflicting with, or being carried above the supply lines on the same poles, need not comply with any requirements as to strength and material except that poles and crossarms shall be of such initial size and so guyed or braced where necessary as to safely withstand the vertical loads to which they may be subjected, including linemen working on them.

In other respects all signal-line supports shall comply with the general requirements of Sections 20 and 21 covering traffic guards, pole clearances, guys and other matters.

(*d*) *Clearances Above Ground* (see also Rule 220 a.)—Signal conductors alone and their guys, span wires and messengers shall have clearances above streets, highways, alleys or generally accessible spaces across or along (and above) which the former pass, not less than the following at 60 deg. F., with no wind, when the spans do not exceed 150 ft.

Signal lines, or guy, span or messenger wires:	Feet.
Above streets and other traveled roadways	18
Along roads in rural districts	15
Crossing above spaces or ways accessible only to pedestrians	10
Above roadways to residence garages	10

The clearances do not apply to guys not carried over roadways, or to guys along one side of a street or alley, unless over driveways. For guys on private right-of-way, or parallel to sidewalk curbs, when not passing over pathways or roadways, no clearance is required; and if passing over only pathways the clearance may be reduced to 8 ft.

For signal-line spans over 150 ft. these clearances shall be increased at the rate of 1 in. for each 10 ft. excess.

(*e*) *Clearances From Other Signal Lines.* (*See also Rule* 220 *b*.)—Signal conductors and their guy, span or messenger lines concerned in crossings, conflicts or common use of poles with other signal lines only shall have a minimum of 2 ft. clearance from those of other lines.

Except for fire-alarm lines this may be reduced where desired, unless one set of conductors is for public use and the other is used in the operation of supply lines.

(*f*) *Grounding, Isolation or Protection.*—Signal lines, including fire-alarm lines, if at any point in their course exposed by supply (or trolley) lines over 400 volts to ground, shall be protected at each station for public use by one of the methods specified in Part III, Section 39. These lines shall elsewhere be isolated by elevation or otherwise guarded so as to be inaccessible to the public.

Signal lines used in the operation of supply lines shall be at all points isolated by elevation or otherwise guarded so as to be inaccessible to the public.

Metal-sheathed cables and messengers shall be isolated or grounded in conformity with the general requirements of Section 20.

289. Signal Lines Used Exclusively in the Operation of Supply Lines.

(*a*) *Under Other Lines.*—(210 *c* and 288 *g*.)—Such signal lines when (1) crossed over by, or (2) having conflicting with them, or (3) on common poles and below, high-voltage direct-current trolley circuits or other supply lines in the operation of which they are used, may be considered and run as ordinary signal lines if (1) the signal lines do not cross over or conflict with, and are not on common poles with and higher than other lines or equipment, and (2) the signal lines and connected equipment are adequately guarded and accessible only to authorized persons, and (3) the precautions of Sections 39 and 54 have been taken.

The supply lines concerned above are not required by the conditions described to comply with the requirements of Sections 25 and 27 as to strength of construction, but the conductors shall be not smaller than permitted by Rule 286.

(*b*) *Over Other Lines.*—(210 *c* and 288 *g*.)—Such signal lines, if crossing over, conflicting with or higher on common poles with other lines or equipment shall comply with all the requirements for the highest voltage supply lines not over 7500 volts with which the signal lines may come in contact, except as to wire sizes for grade C, for which see Rule 285. If, however, the signal lines are protected by fuseless lightning arresters, drainage coils, or other suitable protective devices to prevent the signal-line voltage from normally exceeding 400 volts to ground, they may be run as ordinary signal lines. The method used shall be consistently adhered to throughout the extent of the signal system.

Discussion on Voltage Classification for Power Lines Over Signal Lines.

The grade of construction required for supply lines where crossing over signal lines is given in Rule 214 of the present edition of the National Electrical Safety Code as follows:

Constant-potential alternating-current supply lines of over 7500 volts are placed in grade A; between 5000 and 7500 volts they are placed in grade B; between 750 and 5000 volts they are placed in grade C. Direct-current grounded trolley circuits of over 750 volts are classed in grade A, but other direct-current circuits do not require a definite grade unless they are constant-current circuits. Such circuits are classed according to the value of the current.

Where the crossing of the supply line is over individual twisted-pair drop wires only, or over other unimportant circuits only, the above grading does not apply if effective protection is otherwise secured. Grade B may be submitted for grade A whenever the signal line is restricted to four wires used mainly for local exchange service, where it carries only subscribers' loops or where it carries only two unimportant commercial telegraph wires.

According to definition 6 the voltage stated above means the highest effective voltage between the conductors of the circuit. When one circuit is directly connected to another circuit of high voltage, both are considered as of the higher voltage unless the circuit of lower voltage is permanently grounded.

Examples.—Except for the cases of unimportant wires noted above, the interpretation of these rules in special instances is as follows: An 11,000-volt, three-

phase circuit calls for grade A construction in all cases. If it is star-connected and a single-phase tap of approximately 6600 volts between one phase wire and neutral is run off from this system, this tap would call for grade A construction if ungrounded, but for grade B construction if the neutral wire were grounded. A 6000-volt single-phase circuit run directly from a single-phase transformer or a generator would call for grade B construction whether grounded or not grounded. The same would be true of a three-phase circuit with 6600 volts between the line wires whether delta or star-connected and whether grounded or ungrounded.

Revised Rule.—Telephone engineers claim that the hazard occasioned by the contact of supply wires with telephone conductors is dependent upon the voltage of the supply wires to ground and that, wherever grounded circuits are considered, the grade of construction required should consequently be based upon the voltage to ground rather than upon the voltage between the separate wires of the circuit. This claim appears to be substantiated by the operating experience of telephone companies and is in accord with the means utilized to protect telephone equipment and persons handling it from supply-line voltage which may be superposed upon the line wire.

It has consequently been proposed to change the wording of present Rule 214 so that the grade of construction required for a supply line crossing over or in conflict with a signal line will be expressed in the following manner.

"Constant-potential alternating-current supply lines of over 7500 volts between conductors or 4400 volts to neutral or ground * * * crossing over, conflicting with or having common poles with signal lines, shall comply with the construction requirements of grade A."

Similarly 2900 volts to ground would be stated as the equivalent of 5000 volts between wires, and 440 volts to ground would be stated as the equivalent of 750 volts between wires, in classifying the supply lines as to grade of construction required.

Effect of This Change.—By referring again to particular cases, it will be seen that the change in classification will make a difference when applied to single-phase grounded circuits. For instance, an independent single-phase 6600-volt circuit if ungrounded would still require grade B construction, but if grounded on one side it would now require grade A construction. This is true also if it is derived from a three-phase star-connected 11,000-volt circuit with neutral grounded. A 6600-volt single-phase circuit derived from a delta-connected three-phase 6600-volt circuit and representing one phase of the same would require grade B as before, but if one wire of the delta three-phase line should be grounded the grade of construction is raised to grade A. In practice high-voltage delta-connected circuits are seldom grounded so that such a case is of little practical importance. For ungrounded circuits the requirements would remain as heretofore.

For star-connected grounded circuits the grade of construction required remains as before where all three-line wires are involved, but it is raised for a single-phase tap from such a grounded circuit. This is the particular instance which requires most serious consideration because it will most frequently arise. The hazard which such a circuit presents to a signal line with which in case of failure it may become crossed is regarded to be the same as in the case of a failure of the entire three-phase line from which it is derived, and it consequently seems reasonable to make the same requirements as to the strength of construction since the purpose of a definite strength of construction is to avoid the contingency of such failure and resulting contact.

Summary.—1. The construction required for direct-current circuits will not be altered by the proposed changes in the rules. 2. The construction for any ungrounded circuits will not be altered. 3. Single-phase circuits grounded on one side, whether run separately or derived from three-phase star-connected grounded circuits, will be raised one grade in requirements if coming within certain limits, where signal lines are exposed. For example, a 6600-volt single-phase branch from a four-wire 11,000-volt main would be grade A where signal circuits are exposed, instead of grade B as heretofore.

This change in classification seems reasonable in order to more adequately meet the hazard actually involved and place the classification upon a more logical basis than in the previous edition.

A NEW STEAM-ELECTRIC POWER PLANT AT LUMBER MILL.

Addition of 3200 Hp. in Motors in Large Bellingham Lumber Mill Requires Power-House Extension.

The Bloedel-Donovan Lumber Co., of Bellingham, Wash., has had plans prepared and has begun work on a new power house, by which provision will be made for an additional motor load of 3200 hp. Its lumber plant, which comprises sawmill, planing mill, box factory and sash and door factory, is operated partly by steam and partly by electricity.

A new boiler and turbine house of reinforced concrete and steel will be built for housing two Allis-Chalmers generating units of 2000 kw. and 1000 kw.; a 500-volt motor-generator set, the necessary exciter sets, and a 13-panel switchboard. Barometric condensers will be provided for both turbines. The condensing water will flow by gravity to the cold well, the circulating pumps to be set over that well.

The 1000-kw. generator to be installed is now in use, and will be moved from the old power house to the new one; the 2000-kw. generator is a nearly new machine that formerly was operated in a cement plant. This is a 2400-volt, 1800-r.p.m. unit, the 1000-kw. unit being for 480 volts, and 3600 r.p.m. The plan is to connect the two units together through a bank of three 350-kv-a. transformers, whereby all motors of 50 hp. and higher will be operated at 2200 volts, and motors below that capacity at 440 volts. Direct-current energy at 500 volts will be produced by means of the motor-generator for an electric railway operating on the premises.

The old wooden boiler house, which contains Stirling and Badenhausen boilers, will be enclosed in a larger structure of reinforced concrete, affording room for B. & W. boilers of 2000 hp., which will be installed. "Hog" fuel storage bins are to be built above the new boiler house, and conveyors will be installed to carry the fuel to the bins and to the boiler-furnace hoppers. Several storage-battery trucks are to be ordered for yard service.

The construction of boiler and generator buildings, and the installation of new equipment are in the hands of Chas. C. Moore & Co., with A. F. Blair as consulting engineer. Geo. T. Thirsk, electrical engineer, of Seattle, made designs for the electrical installations and will supervise them.

Editorial Comment

City and State Utility Regulation

THE outrageous bungling with which our average municipalities handle public utility matters is again coming into strong contrast with the sensible procedure followed by our state public service commissions. For example, if street-car fares were left to the dictates of our demagogic city politicians, they would remain at the old five-cent level, even though much higher wages of the crews and other increased costs and burdens are driving the traction companies into bankruptcy. As a result of municipal blundering one large city was without street-car service for a month and in almost countless other cities the companies are in dire straits or actually in the hands of receivers. As if this muddling were not bad enough, many city officials are advocating municipal ownership of traction lines; in one city a commission has just been appointed to waste $250,000 in drawing up plans for a municipal traction system and not one of the commissioners is versed on traction matters.

In striking contrast is the orderly manner in which those state commissions vested with authority on traction fares have gone about revising these up or down as conditions require. Obeying the findings of the courts that the regulatory powers of the state are superior to any implied fixity of franchise rates, they make an unbiased investigation and, if this discloses existing rates as too low or high for rendering good service and allowing reasonable return on the investment, the rates are adjusted to suit. In view of the fairness of this regulation to all concerned, any effort to curtail state regulation and restore city control should be strongly opposed.

Customer Ownership of Utility Stock

NOT many years ago it was quite prevalent among public utility corporations to regard the public as a sort of avowed enemy. The reason for it was simple enough. Most institutions that serve the public learn, through the petty bickerings, attacks and complaints of individuals that go to represent the public, to acquire a genuine disrespect for it; and this in spite of the fact that the public is the only source of income for the utility.

It is a common instinct for people to return like for like. Disrespect breeds disrespect. So the disrespect between the public and the utilities was mutual. It was due chiefly to misunderstanding and lack of knowledge of each other, that is, to absence of community of interests.

With the latter in view, several central-station companies inaugurated about two years ago the practice of offering shares of their stock or other securities to their customers. Since that time a large number of the representative public utility corporations have followed this lead, and from time to time announcements are made of companies adopting the plan.

Customer ownership has proved advantageous for a number of reasons. For the central station it is an excellent builder of good will, which is now considered necessary to the successful operation of a public utility; customers owning stock are more appreciative of the service and are better prospects for additional appliances and load; customer ownership helps partly to solve the question of securing additional capital. For the customer, purchase of public utility stock usually proves to be an excellent investment.

It is gratifying to note the change of attitude that is developing between the public and the central stations. Another hindrance to progress is thus being eliminated.

Electrical Christmas Decorations and Wiring

SANTA CLAUS without the Christmas tree and the fairy lights of varigated color would hardly be a real Christmas, such as all of us that are now grown up look back upon our childhood days with fond recollection and treasured memory, such as the little ones of today await in the expectancy of hope and joy of innocent youth.

Every Christmas brings its list of accidents and tragedies because of fires, starting from naked flames or sparks around the Christmas trees and seasonal festoon. Every naked flame from candle, or oil or spirit lamp, and every match used around the flimsy decorations is a fire hazard. And many of the hazards materialize every year, to turn joy and merriment to sadness, suffering and death. Every electrically illuminated Christmas tree is a safety measure, every electric lamp that replaces an oil or spirit lamp and the tallow candle makes the danger of fire less.

Electrical interests in selling Christmas tree lamps and fittings have a magnificent opportunity to further the gospel of safety. That such decorations are installed instead of other dangerous types is an immense gain for the cause of safety. Safety should be made still safer, however, by careful workmanship and due regard to the essentials of electric wiring. And that this may obtain is largely a matter of education and publicity.

The electrical industry has a very great responsibility in advocating and encouraging the electrical Christmas decorations. But it has a further moral responsibility of advocating safe wiring methods and the practice of common-sense precautions.

Current Events

New York Section, A.I.E.E., Organized—O.E.L.A. Holds One-Day Meeting — Rural Line Extensions in Wisconsin

A. I. E. E. SECTION TO BE ORGANIZED IN NEW YORK CITY.

Meeting Held on Dec. 10 to Make Arrangements for Organization of Local Section in Metropolis.

The question of organizing a New York City Section of the American Institute of Electrical Engineers has been discussed informally from time to time for several years past, but, as most of the monthly Institute meetings were held regularly in New York City, the need for a local organization was not so urgent as in the other cities of the country. In recent years, however, it has become more and more the custom for some of the Institute meetings to be held in other cities. The growth of the Institute membership and the industrial developments throughout the country make it more essential that in order better to fulfill its function as a national organization, an increasing number of meetings of the Institute, in addition to regular section meetings, must be held in the various cities of the country.

This year, for example, an Institute meeting was held in Philadelphia in October, and others will be held in Chicago, Pittsburgh and Boston, during the months of January, March, and April, no meetings having been arranged to be held in New York City during those months. In order, therefore, that monthly meetings may be held in New York City whenever the Institute meetings are held elsewhere, it is considered essential that a local section be formed, thus placing the New York City membership on the same basis with relation to the Institute as the membership in other parts of the country.

At a meeting of the Board of Directors of the Institute, held Nov. 14, a petition, signed by over 100 members in New York City and vicinity, was presented for authority to organize a section to be conducted under the same general plan as the other 34 sections of the Institute. The directors approved the request and a special meeting for the purpose of organizing, electing officers and taking such other action as was deemed desirable was held in the Engineering Societies building, 29 West 39th street, at 8:15 p. m. Dec. 10.

SPECIAL MEETING OF OHIO ELECTRIC LIGHT ASSOCIATION.

Association Revenues Increased—Safety Code, Fire Marshal's Orders and Legislation Discussed.

At the call of its Executive Committee a special one-day meeting of the Ohio Electric Light Association was held at Miami Hotel, Dayton, Ohio, on Dec. 3. Vice-President F. H. Golding presided because of the inability of President C. H. Howell to attend. About 200 representatives of central-station companies were present. Secretary D. L. Gaskill presented an amendment to the constitution increasing the dues of member companies so as to strengthen the financial resources of the association and enable it to broaden its work in spite of increased costs. After discussion and revision it was adopted. It provides for payment of one-eightieth of 1% of the gross annual receipts, with minimum charges of $5 for towns of 2000 and less, $10 for cities of 2000 to 5000, $25 for those of 5000 to 20,000, and $50 for cities of over 20,000; where companies serve more than one municipality the aggregate population of the cities served is to be taken in determining the minimum charge. It is estimated that the annual income from member companies will be raised from $1754 to $5327 by the change.

There was some discussion of the proposed changes in Part II of the National Electrical Safety Code, containing rules for construction of overhead lines. H. W. Hough, of Cleveland, presented a report of the meeting held at Philadelphia on Oct. 27 to 29 and attended by representatives of the Bureau of Standards, National Electric Light Association and other central-station interests, the object of which gathering was to discuss the proposed changes in these rules.

The recent orders of the Ohio fire marshal calling for inspection of electrical installations of all premises before central stations furnish service thereto, and also requiring safety inclosed switches for service and other locations came in for considerable spirited discussion.

Legislation pending before the Ohio Legislature that affects central stations was reviewed by Secretary Gaskill. One bill proposes to assess part of the cost of street lighting of special character on the abutting property owners. Another bill would allow the State Utility Commission to postpone any proposed rate increase after same and the reasons for it had been filed by the utility company.

As to the coal situation most of the Ohio central stations reported they were in fairly good condition; although some of them had only a few days' supply on hand, they were able to secure more as needed. W. W. Freeman, of Cincinnati, who was assisting the regional coal administrator of that district, urged that the central stations use their best judgment in coal conservation and refrain from bothering the coal administrators unless absolutely necessary.

WISCONSIN CONFERENCE ON RURAL LINE EXTENSIONS.

Meeting Held at Madison to Discuss Formulation of a General Policy on Rural Line Extensions of Central Stations.

At Madison, Wis., there was held on Nov. 21 a conference of utility interests, rural customers and others interested in the extension of electric light and power lines into rural districts. The meeting was

called by and held in the rooms of the Railroad Commission of Wisconsin.

The conference was not as successful as was wished, although there was quite a large attendance from all parts of the state. The question of rural extensions and use of electricity by the farmers has come to the fore very rapidly in the last two years due, no doubt, to the unprecedented prosperity of the agricultural districts. This demand for service has come at a time when all utilities were suffering from the financial stringency and were practically unable to secure capital to make needed extensions. It was recognized and was admitted by all utility operators that the most satisfactory method of extending this service would be to have the work done at the expense of the utility. Practical considerations at the present time make this out of the question.

Two methods have been followed in Wisconsin. By the first the utility has made the extension where the cost of it has been borne by the farmers to be served. The result of this method has been that the farmers on a line extending, say, east from the utility, would receive service at an initial expense of $250 each, while the farmers residing, say, west of the utility would be obliged to pay $350 or $400 each due to the fact that their district was more sparsely settled than the district on the other side of town. Another serious objection has been that there might be 12 possible customers on the proposed line, 9 of whom would contribute to the cost of its building. The other three farmers, although refusing to contribute to the initial cost of the line, would demand in many cases and would be able to force the utility to give them service since the utility is a public service corporation and has facilities for serving such farmers passing alongside their farms. In selling energy to rural customers, if the expense of constructing the line has been borne by such customers, the utility has usually put into effect the urban rate modified in some instances by a higher minimum monthly charge.

The other method which has been followed to a considerable extent in Wisconsin has been for the farmers in a certain district wishing to receive electrical service to incorporate as a distributing company, the prospective consumers taking stock enough to cover the cost of building the proposed line. This distributing utility purchases its energy on a wholesale rate at the city limits and in turn bills it to its customers at a higher rate planned to include the ordinary distribution and operating expenses of the farmers' utility. This has resulted in farmers usually paying a higher rate than was charged by the local utility in the city and has also been open to the objection that certain farmers would refuse to become stockholders and yet demand and be entitled to receive service from the company.

At the conference, the utility operators who were present were quite unanimous in their opinion that the present rates for rural electric service in effect are unremunerative and in fact throw a burden upon the urban consumers of making up the deficit arising from the operation of the rural business. The representatives of the farmers and consumers and the representatives of the farmers' distributing companies who were present agreed that the rates for rural business ought to be compensatory and that no burden should be thrown on the urban customers by reason of rural service. The rural distributing companies that have been formed aim in their rates to cover merely operation and provide no return on the investment.

It was pointed out that, if the rate were made sufficiently high to cover a return on the investment, they would then be able to sell their stock on an investment basis and could offer service on equal basis to all prospective customers who applied, whether stockholders or not. One suggestion was made that in both cases the utility should establish a consumer charge which should be equal to the interest charge upon the investment per consumer and that, where the consumer was a stockholder, or where the consumer had contributed his proportion of the expense of constructing the line, this consumer charge should be waived. It was claimed that this would place the nonstockholder and the farmer who refused to contribute to the cost of building the line on the same basis with stockholders and those who did contribute.

All of these plans have ignored those elements of the excess cost of rural service over urban service, such as increased depreciation per customer, increased maintenance per customer, the increased line losses due to the fact that there are fewer customers per mile of line, increased transformer losses due to fewer customers per transformer, etc.

It was agreed when the meeting adjourned that those present should formulate their experience and views and submit them to the commission which would then make a study of the matter presented and, if feasible, have printed in pamphlet form a summary of this information together with such recommendations or proposals as the Commission might deem advisable. In calling this conference it was not the Commission's idea that it would be able to put into effect any hard and fast rule governing rural extensions. It was thought, however, that it might perhaps establish some general principles which would govern the formulating of such rules.

TORONTO CONTRACTOR-DEALERS HEAR ADDRESS ON CO-OPERATION.

At a meeting of the Toronto (Can.) District of the Ontario Association of Electrical Dealers and Contractors, held in Toronto Nov. 24, at which there were present 50 members of the association besides representatives of the Toronto Hydro-Electric System and Hydro-Electric Commission of Ontario, James M. Wakeman, general manager of the Society for Electrical Development, gave an address on co-operation in the electrical industry. He outlined the activities of the Society for Electrical Development, told what it had done in the United States and explained its ability to render similar service in Canada. The Society has among its Toronto members the Hydro-Electric System and the Canadian General Electric Co., besides a number of the largest and most progressive contractor-dealers.

Among other suggestions Mr. Wakeman made were the establishment of an electrical page in a leading Toronto paper and the holding of an electrical exposition in Toronto early next year, with the possibility of having a building devoted entirely to electricity at the great Canadian National Exhibition held each fall in Toronto. These suggestions met with the approval of the meeting and steps were taken to form a committee to perfect the plans.

After Mr. Wakeman had spoken, H. H. Couzens, general manager of the Toronto Hydro-Electric System; C. H. Wilson of the Apex Electric Appliance Co.; George J. Beattie, well-known Toronto contractor-dealer, and Kenneth McIntyre, secretary of the Association, all spoke, expressing their appreciation of the good work the Society has done for them.

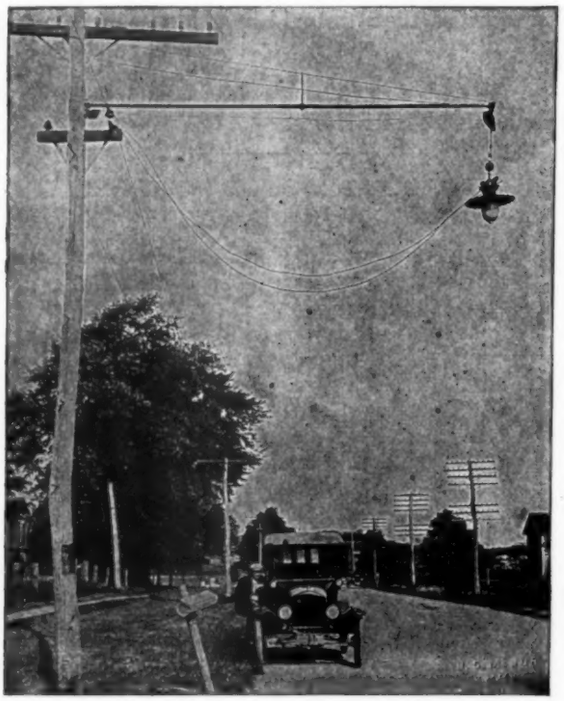
Commercial Practice

Better Highway Illumination—Municipal Christmas Tree Lighting — Electricity for Heat Treatment of Metals

NECESSITY FOR BETTER LIGHTING OF COUNTRY ROADS.

Trend of the Times Shows Need for Extensions of Lighting to Country Roads—Field for Central-Station Commercial Departments.

The matter of providing illumination for our country roads has been given scant consideration in the past because the need for it has never been seriously felt. The rural roads of today are far different from the rural roads of yesterday. There are conditions existing which demand a better and higher grade of illumination. The great volume of automobile traffic not only demands better illumination from the standpoint of safety to the tourists and pedestrians but also for greater convenience and comfort in traveling. A large number of country roads are narrow and in



Mast-Arm Fixture Suitable for Lighting Country Roads.

order to permit drivers of the various vehicles to pass one another without a collision a reasonable amount of illumination is indispensable. Where the roads are rough and in poor condition, illumination should be provided to help the tourists avoid mudholes and irregularities. This is particularly true in bad weather or after heavy rains when ruts and mudholes are quite common even on the best roads.

One of the main reasons for the retarding of rural lighting is the wrong impression that it would be a very costly and expensive venture. However, under present-day methods of efficient and economical distribution of power, the expense is comparatively small.

In many cases the roads already carry cross-country transmission systems from which power may be taken, and by means of small regulating transformers mounted on the poles the high-voltage transmission may be reduced to voltages suitable for operating small circuits of lamps connected in series and covering several miles of country road. Fixtures of an inexpensive design, with or without glassware, may be used. They should be placed by means of long mast arms, as shown in the accompanying illustration, or by cable strung across the road from post to post, so that the light is well out toward the center of the road where it cannot be obstructed by trees. These fixtures require little attention other than the occasional cleaning of the reflector and renewal of lamps. The entire system may be operated automatically by means of a time switch controlling the regulating transformer, so that no personal attention is needed other than the winding of the clock once in 8 days. In this way a system may be operated at a relatively low first cost and with a maintenance expense consisting mainly of power cost and lamp renewals.

It should not be expected to have a uniform intensity of light attained throughout, because the spacing distance would of necessity be relatively large and direct illumination over the entire area would be out of the question. The silhouette principle may, however, be used to good advantage under these circumstances. The lighting creates a light background on the road surface against which dark objects intervening along the road are shown up in relief. The nature and location of the object may be discerned by its dark outline against the light background. While this type of illumination does not enable one to discriminate or to observe the details of an object in the road, it is at least possible to see enough of it to avoid collision and increase the safety and convenience of travel.

In some cases prismatic refracting glassware can be used to good advantage. The refractor prisms send the light rays into useful directions and cause them to be distributed more extensively along the length of the road. Their function is to make the light intensity more nearly uniform over the entire area to be lighted.

The illustration shows a type of fixture very suitable for road lighting. It is a 20-in. radial-wave reflector streethood body equipped with a diffuser and may be used with lamps as large as 600 cp., consuming approximately 350 watts. The long mast-arm serves to bring the light well into the center of the road, making it possible for the light to be utilized for a considerable distance over the road. Another type of fixture consists of a streethood equipped with a cable clamp for mounting in the center of the road on a cable strung across the road between posts. This is a less expensive method of removing the light from

the obstruction of trees hanging over the road, but it has the disadvantage of not being so readily accessible as the mast-arm fixture where the lamp may be lowered to the road for cleaning or renewal by means of the lamp rope and pulleys.

ADVANTAGES OF ELECTRICITY IN HEAT TREATMENT OF METALS.

In presenting the argument for the use of electricity for heat treatment of metals, the central-station salesman can enumerate the following advantages of the electric resistance type furnace, which were compiled by C. A. Winder, industrial heating engineer, General Electric Co.

(1) Their automatic operation greatly reduces the labor cost and does away with the human element, an uncertain thing at all times.

(2) The upkeep of an electric furnace is extremely low and its life very long.

(3) It is possible to obtain a neutral or reducing atmosphere meaning decreased oxidation of the product.

(4) Rejects are practically eliminated often effecting a saving of thousands of dollars.

(5) Experience has demonstrated that gear blanks which have been treated in the electric furnace can be machined 20% faster than heretofore.

(6) Working conditions in a heat treating room equipped with electric furnaces show a great improvement over others due to a lower temperature of the room and the absence of fumes and noise.

(7) Floor space, which is always an item to be considered, is reduced to a minimum on account of the absence of piping, storage tanks, etc.

(8) A reduced fire hazard as a medium for lower insurance rates; again a saving in actual dollars and cents is effected.

The General Electric Co. has equipped heat-treating furnaces in sizes varying from a small car type furnace 4 ft. long, 3 ft. wide and 2 ft. high having a connected load of 18 kw. and a maximum operating temperature of 1800 deg. F. to a vertical cylindrical furnace 34 ft. deep by 7 ft. 6 ins. diameter with a connected load of 750 kw.

ILLINOIS CENTRAL STATION GETS INCREASE IN RATES.

An increase in rates for electric service has been granted to the Athens (Ill.) Electric Light & Power Co. in an order issued by the Public Utilities Commission. The new rates are: For the first 50 kw-hrs. per month, 11 cents per kw-hr.; for the next 250 kw-hrs., 8 cents; over 300 kw-hrs., 6.5 cents. A minimum charge of 50 cents per horsepower of connected load is fixed, no charge to be less than $1 per month per customer.

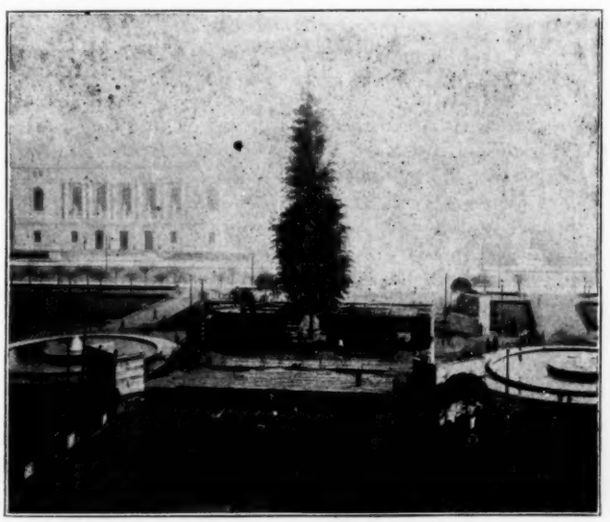
CREDITABLE SPEED IN CHANGING FROM STEAM TO ELECTRIC DRIVE.

The Southern Wood Preserving Co., Georgia, operated its own steam plant, used not only for power purposes but also for producing steam in their operations. The steam engine broke down, immediately interrupting all shafting. Asked to render assistance, the Georgia Railway & Power Co. investigated the situation and the layout of the plant. On the Saturday morning apparatus was ordered and the utility got under way to deliver service. The following Tuesday morning the plant was working again, after two days of interruption, and has been working ever since.

ILLUMINATED CHRISTMAS TREE AT SAN FRANCISCO.

Municipalities contemplating the installation of a Christmas tree in connection with a civic celebration of Yuletide can obtain valuable suggestions from the installation of a tree that was erected in the San Francisco civic center and which was a part of the Christmas eve celebration last year.

The tree was 150 ft. in height and was decorated with 10,000 jewels from the tower of jewels at the Panama-Pacific Exposition. The tree and jewels were illuminated by powerful searchlights placed on the roofs of adjoining buildings and in addition 100 flood-



View of Civic Center at San Francisco, Showing Platforms for Installation of Lighting Projectors for Illuminating Christmas Tree.

lighting units, installed on elevated platforms near the tree, were used to make the lighting effective.

Telephones played an important part in directing the pageant held in connection with the celebration. It was necessary to install a switchboard and a large number of transmitter and receiver sets at various points of the civic center. These were also used in directing the illumination of the tree.

PROVIDING FACILITIES FOR FUTURE POWER REQUIREMENTS.

A good illustration of the advantages to be gained by using foresight in planning for transformer station equipment is given by the case of the Eastman Kodak Co., Rochester, N. Y. About two years ago the company contracted with the Rochester Railway & Light Co. for a maximum demand service of 500 kw. With good exercise of foresight, a transformer vault much larger than was needed was installed. Now, with the approaching completion of a new factory building this service is to be increased to 1200 kw., which can easily be done simply by the installation of additional transformers in the vault. The money saved in planning and construction will more than offset the first cost and aid investment charge on the vault, and there is still room in it to take care of future requirements for a long time.

Operating Practice

Transformer Cooling—Underground Steam Lines—Safety Barriers—Mixing Solid Fuels—Air Supply—Condensers

AUTOMOBILE RADIATORS INCREASE TRANSFORMER CAPACITY.

Georgia Railway & Power Co. Follows Interesting and Unique Practice to Increase Capacity of Large Transformer Bank.

The Georgia Railway & Power Co. connects up with the Tennessee Power through a bank of tie-in transformers of 3000 kv-a. capacity at the Lindale substation owned by the latter company. As it became necessary to take additional quantities of power from the Tennessee Power Co.'s lines it was found that the tie-in bank of transformers was running very hot. The average overload varied between 125 and 150%, so it became necessary to provide additional cooling or higher rate for the dissipation of heat.

The method employed by the Georgia Railway & Power Co. to increase the capacity of the existing transformers was very ingenious and has so increased the safe current-carrying capacity of the transformer bank that 125 to 150% can be carried continuously. Six radiators from Ford cars were mounted close to the transformers and connected in multiple between a 2-in. over-flow pipe at the top of the transformers and a 2½-in. discharge pipe at the bottom of the transformers. A centrifugal pump was connected in the discharge pipe line, this pump being motor driven. The pump forced the oil in the bottom of the tanks under pressure and out of the top, where it was then forced through the six Ford radiators back to the transformers again. Another motor, driving a blower was so located that the air current passed along and through the radiators. The air was humidified before passing over the radiator surface, in this way still further lowering the temperature of the oil.

With the above installation the company was able to pass 150 g.p.m. through the transformers, equivalent to 216,000 g.p.m. every 24 hrs., and by so doing have been enabled to keep the temperature of the transformer oil down to about 40 deg. C. with the transformers carrying 150% of load continuous. A similar outfit is being used by the Georgia Railway & Power Co. where they tie-in with the Columbus Power Co. at the Newman substation.

FACTORS IN INSTALLING UNDERGROUND STEAM LINES.

Recommendations by Wisconsin's State Power Plant Engineer for Reliability and Economy of Maintenance of Underground Steam Lines.

Pipe lines for the transmission of steam and hot water should be installed with greater forethought and care to detail when installed underground than when laid in tunnels and buildings where they are reasonably accessible for inspection and maintenance. When laid in ground, deterioration and failure is only brought to light by failure, which usually occurs during the winter when the demand for service is most pressing and the difficulties for making repairs are greatest.

John C. White, power plant engineer for the state of Wisconsin, recommends careful attention to the following features, if service at the least cost and service of the highest continuity (often compatible with low cost) are to be obtained:

(1) Correct design of piping and construction suitable to the conditions encountered.

(2) The pipes should be protected by a conduit not easily displaced nor broken, and one that is not affected by the temperatures to which it is subjected nor by the character of the soil in which it is laid.

(3) The pipes should be so anchored and supported that their position is assured and that freedom of movement under their temperature changes be ample.

(4) Steam and hot water lines should be so insulated that the heat loss is reduced to the economical minimum, and the insulation should be so applied that it will not be displaced by the movement of the pipes under temperature changes.

(5) Drainage should be such that the pipes are always protected from water, either dripping from above or rising about them, and it should be possible to determine their condition at any time by inspection at manholes or outlets.

(6) The arrangement of the pipes in the conduit should be such that any one of the lines may be removed and replaced without disturbing the others. It is desirable also that a renewal can be accomplished by releasing at anchors and connecting points and uncovering only such length of the conduit as may be necessary to permit withdrawal and replacement.

(7) Steam pipes should be so pitched and drained that they are always free from water.

SAFETY PANEL TO PREVENT EXPLOSION IN TRANSFORMER COMPARTMENTS.

Pertinent Features in Protecting Station Buses, Instrument Transformers, Etc., from Accidental Contact and Internal Explosions.

The Philadelphia Electric Co. has done much toward furthering the interests of safety. Part of this work has taken the form of safety appliances, methods and practices. Part has been in the form of education and instruction for, after all, it is the human element wherein lies the greatest weakness and the most danger.

Telling of some of the practices of the Philadelphia Electric Co. before the Safety Congress convening in Cleveland last October, Walter C. Wagner brought out some pertinent facts relating to barriers for segregating buses, potential and current transformers, disconnecting switches, phases, etc.

He advised that barriers should not support live buses or apparatus subject to stress due to electrical

disturbance, and, where isolating live parts, should have a minimum of reinforcement consistent with mechanically safe construction. Doors should cover the openings between the barriers, and be designed to be readily removed for access to the compartments covered. Such doors may be painted white pine frames, paneled with impregnated asbestos where they enclose conductor runs and instrument transformers; paneled with clear wire glass in front of disconnecting switches; and built of heavy wire screening where heat radiation necessitates this construction, as in front of reactance coils. Such doors must be of small size, light weight, not easily damaged in handling, and rugged in construction. A pair of handles for detachable wall doors, and detachable hinge supports, should allow ready removal. Where covering ceiling runs, the doors should be permanently hinged, with latches to fasten them in place. A door having a special panel in which a spring-hinged panel is inserted is placed in front of locked current transformer and oil switch compartments, where an electrical breakdown might cause a sudden formation of gases by the Philadelphia Electric Co.

The general identification of the character of equipment by those concerned in the maintenance and operation of electrical stations, should be based on a knowledge of the nature of the construction—namely, the method of isolation, type of barrier, support, and insulation—and of the general characteristics of the apparatus connected thereto. In a system where unvarying practice in arrangement of equipment exists, as a fixed order of phases and number of compartments and apparatus, the relative positions are a further means of identification, especially when clear and adequate, yet simple, wiring diagrams showing physical arrangements of units, apparatus, and circuits should be at hand, and where the more hazardous situations are, in general, made inaccessible by elevation or enclosures.

HUGE VOLUME OF AIR HANDLED BY POWER PLANTS EMPHASIZED.

Provision for Air and Need for Comforts for the Men Brought Out—Velocity of 26½ Miles an Hour Often Attained.

In commending the ELECTRICAL REVIEW upon a recent editorial on "Air Supply to the Boiler Room," because of the importance and timeliness of this subject that affects at once the performance of the furnace, the capacity of the plant and the health, comfort and output of the boiler-room crew, O. R. McBride, Andrews-Bradshaw Co., points out the question of air supply assumes greater importance in the larger plants than in the smaller ones.

"In the small plant the question as to how the air gets into the boiler room and thence into the furnace does not assume the importance that it does for the larger plant," says Mr. McBride. "For a single one-thousand horsepower output, 18,000 to 20,000 cu. ft. of air must get into the boiler room per min. At a velocity of 30 ft. per sec., corresponding to, approximately, 26½ miles per hr., the combined area of all openings is quite large. The above, surely, serves to indicate the serious effects of restricted openings upon the action of draft-producing agencies, regardless of whether the draft is due to chimney or mechanical means.

"Comfort of the man in the boiler room is very important. The old idea that a man would become lazy if comforts were provided him has been answered by facts. It belongs in the discard along with the other one that the use of automatic devices makes men careless."

In designing a boiler room it should be borne in mind that human beings must spend a large portion of their lives in it. Make the boiler room habitable—and men who are comfortable are able to put in more time and effort on their work, lay out the station so that the furnaces will not be partially asphyxiated during the cold weather. Install whatever automatic appliances are indicated, that they may accomplish better work than men, alone, can accomplish, but with the intention that comfortable, satisfied men may supervise the entire performance of the boiler room because that is all that remains for them to do.

MIXTURE OF ANTHRACITE DUST AND SCREENINGS LOWERS FUEL BILL.

Saving of Nearly 14 Per Cent Obtained by Mixing Coals with Underfeed Type of Stoker.

A power plant located on the lake front in Minnesota has brought about a considerable saving in its coal bill and at the same time has so far been unaffected by the shortage of bituminous coal resulting from the strike, by mixing anthracite dust and Pittsburgh screenings in the proportion of 40% of the former to 60% of the latter. The plant contains three 228-boiler hp. B & W boilers, served by 3-retort Taylor stokers.

The anthracite dust and screenings when mixed in the above proportion effect a cost saving of 13.5% per ton of coal burned. High combustion efficiencies are obtained and ratings up to about 125% nominal are maintained, the limit being imposed by permissible draft in the wind box, which if exceeded causes the anthracite dust to be blown into the furnace. By using anthracite dust for banking their fires the company is able to make a further saving, the fuel for banked fires being about 15% of the total fuel used.

INFLUENCE OF THE CONDENSER UPON FUEL ECONOMY.

Attention to the Condenser as Well as to Proper Use of Fuel Emphasized.

It should be borne in mind that economies obtained by careful firing and high combustion efficiency may be counteracted and neutralized through careless operation and maintenance of the condenser. In other words, efficiency in production of steam may be made very largely ineffective by inefficiency in the utilization of the steam. Dirty tubes and leaks will lower the vacuum, and the lower the vacuum the higher the coal consumption per pound of steam, requiring a greater power input to maintain it. Boiler-room instruments are a good investment when used intelligently. So are instruments for indicating the vacuum. Conditions change rapidly in the furnace and one must be ever on the alert if combustion efficiency and operating economies are to be sustained. The condition of the condenser usually changes gradually and so can be the more readily watched and remedied. The thing to bear in mind at all times is that a clean condenser is a factor in coal conservation.

Contractor-Dealer

Portland Contractor Opens an Attractive Electric Store—Comments on the Different Angles of Appliance Selling

NOVEL ARRANGEMENT OF NEW PORTLAND ELECTRIC SHOP.

Contractor, Who Becomes Dealer, Shows Ingenuity in Planning New Store in Oregon City—Makes the Most of Window-Display Space.

There is a growing tendency among electrical contractors to enter the merchandising field, and while many statements have been made to the effect that the contractor, as a general rule, makes a poor merchant, this assertion is being disproved in the majority of cases. People are too apt to look for failures than successes in electrical merchandising. But, given a few years' experience in installing electrical material and with an insight into business methods, the contractor is in much better position to ultimately become a successful electrical dealer than some general merchant who branches out to handle electrical appliances. If anything it is less difficult for the contractor to learn merchandising methods than it is for the general merchant to acquire knowledge about the uses and sales points of electrical appliances.

The Smith-McCoy Electric Co. has been in the contracting business in Portland, Ore., for a number of years and recently decided to retail electrical devices. Selecting a desirable location—on Fifth street, between Washington and Clark streets—the company opened a store which demonstrates its insight into merchandising methods. The store has small street frontage, but this disadvantage was overcome in a very effective way. Realizing the value of window display space the company arranged the ground floor of its store so that the entire floor could be easily seen from the street. White walls, high-

Pleasing Arrangement of Interior of New Electric Shop Opened in Portland.

intensity lighting, window displays with comparatively little background, and an uncrowded arrangement of electric washing machines, vacuum cleaners, table lamps, etc.—these made an effective display that presented an inviting appearance to the would-be customer. Then to accentuate the effect of the first-floor display the company made window display space out of the second-story front of the store. The novelty and effectiveness of the brilliantly lighted window displays and store are shown in the accompanying illustration.

The other illustration shows there is little counter space on the first floor, but the arrangement makes possible easy demonstration of the larger electrical devices such as washing machines, ranges, ironing machines and vacuum cleaners. It is a novel departure from the usual "store" arrangement.

Store Front in Which Window Display Is Used to Fullest Advantage.

TRIMMING WINDOWS TO GET CHRISTMAS TRADE.

Some one has said that: "Merchandise well displayed is half sold." This being true, the proper display of merchandise becomes one of the most important phases of the modern retail store. Especially is this true during the holiday season. People are frequently at a loss to know what to purchase as gifts for their relatives or friends. The store that has its merchandise well displayed in the store and its windows well trimmed is the one likely to get the business.

Merchandising Suggestions for the Electrical Dealer

How Salespeople Can Improve Themselves—The Philosophy of Long Profits—Good Illustration of Use of Motion in Displays

IN COMMON with salesmen in other lines, the salesman in an electrical store, in order to increase his income and prospects, should make efforts to improve himself along three general lines—appearance, language and general intelligence.

As to appearance, a great deal of progress has been made in other lines in the general appearance of the salesman. These things should be carefully considered by the salesman—first his haircut, then the collar, shirt, clothing, shoes and the appearance of his face and hands.

At a sales conference held in New York City recently, 100 men were analyzed as to their appearance. Eight men had hair cuts that passed; 20 had collars that were the right size and right style; 10 had neckties that harmonized with their shirts; 15 had shirts that fitted and were of the right sleeve length; 12 had suits that fitted and were pressed and clean; while only 18 had shoes that fitted with heels that were not run down.

It is a difficult matter to criticize a salesman's appearance, but if salesmen and saleswomen are not carefully groomed, absolutely clean from head to foot and trim in appearance, they lose greatly as the customer approaches them. Any salesman can dress better for the same amount of money. The trouble with most salesmen is that they compromise and buy cheap things. They do not study colors and invariably are too "flashy." If their appearance is right, customers sense it very quickly, and the customer unconsciously buys more readily.

As to language—there are more than 100,000 words in the English language, but the average salesman uses less than 2000 in his daily selling. There are four ways of improving one's English. First, study grammar; second, read books rich in description, such as those written by Dickens; third, write a great deal (for instance, write two or three advertisements or sales-letters about electrical appliances each week); fourth, cultivate the acquaintance of and associate with people who use pure English.

By general intelligence is meant knowledge of the merchandise the salesman is handling as well as courtesy, good manners and tact in dealing with customers. The salesman must get out of his own environment and improve his general education regarding people—in other words, live the lives of other people mentally—if he wishes to succeed in selling large quantities of merchandise.

Long Profits or Fat Ones for the Electrical Merchant.

Which would you rather make—40% profit or $10,000?

Forty per cent is a rather long profit. Ten thousand dollars is a fat profit. Nine out of ten electrical merchants, new at the merchandising game, are often hypnotized by the length of a profit and do not stop to figure up its probable fatness. The experienced merchant pays little attention to the discount but figures up his probable gain. Many a man has become a millionaire on 1% profit.

For example, if some bright salesman should offer you some electric irons at "40 off" the proposition would look good at first glance. At $6.50 list, you would be making $2.60 on each iron instead of, say, $2.28. You would want a gross.

But wait—

It is going to be hard to sell these irons. They do not look quite as good as the standard irons. Maybe you can sell only two dozen of these with a gross profit of $67.20 in the same time it would take to sell three dozen of the others, with a gross profit of $77.40. There will undoubtedly be more repairs which will cost time and money, too. So on second thought you had better not buy them. Of course, the clever salesman will tell you his long-profit iron is just as good, that his firm does not advertise and gives you the benefit of the advertising expense.

But don't let that fool you.

National advertising is *not* paid for by the dealer or the consumer. It is paid for out of the reduction in selling expense and the savings of quantity production. A concern making 150,000 irons a year can certainly build and sell irons 20 cents apiece cheaper than the concern making 5000. And 20 cents apiece, saved, will pay for $30,000 worth of advertising to maintain the big production. Not alone that, but the advertising is the surest possible guarantee of quality, because no manufacturer can advertise continuously an inferior product. Advertising acts as a deadly poison to the four-flusher.

There is only one excuse for an exceptionally long profit—cheapness. And for this reason a long profit is generally skinny.

Mechanical Figures in Window Display Attract Attention.

Life or its simulation attracts more attention than anything else in window displays. When wax figures are used and these figures move mechanically, the display is one that never fails to bring to a halt all who pass. The Oklahoma City (Okla.) Electric Co. recently had a display which represented a living room, with the usual quota of chairs, table, rug, curtains, pictures, etc. At one side was a small boy, who at intervals pulled a string attached to a basket in the ceiling, releasing a stream of corn meal. Close at hand was a young matron, with vacuum cleaner, who immediately swept up the fallen meal.

Considerable ingenuity was expended in arranging the mechanical figures. The mechanism required included a fractional horsepower motor belted to a 3-in. pulley keyed in turn to a worm gear shaft, which operated the arm of the patent mother. As the cleaner moved back along a guide wire it struck a button, which, connected to the corn meal trap, opened the trap, each time spilling some meal, and at the same operation lowering the boy's hand as if he had pulled the string.

New Appliances

Small Inclosed Motor for Appliance Drives—Combination Fire Pump—Auto Lamp—Steel Mill Electrical Apparatus

Small Direct-Current Motor Embodies Unique Splashproof Feature.

A new small direct-current motor incorporating a splashproof housing of unique design which completely protects the winding and all live parts from splashing water or accidental contact is proving popular for light domestic and industrial purposes. Made by the Westinghouse Electric & Manufacturing Co., it is known as the CDH type and is built in ⅛ and ¼-hp. sizes.

The large commutators and box-type brush holders with large brush area make these motors particularly well adapted for operation from the low-voltage storage-battery plants now being installed in great numbers on farms and in suburban residences. Motors wound for 32 volts are in great demand in rural communities for application to house pumps, washing machines, cream separators and similar machines.

Also, a wide field of application for motors of this type, wound for 115 and 230 volts, comprises light labor-saving machines used in homes, offices, stores, manufacturing plants, etc. They are interchangeable mechanically with alternating-current motors of similar ratings, and therefore appeal strongly to the manufacturer of motor-driven devices. Their splashproof feature makes them especially adapted to use on washing machines.

The frame consists of a seamless, forged-steel ring to which the cast-iron foot and end brackets are bolted. The pole pieces are bolted to the steel ring, thereby permitting the use of form-wound field coils, which are easily replaced in case of injury. The motors are light in weight, compact, sturdy and uniform in performance.

Automobile Searchlight That Also Serves as Parking Lamp.

An improved model of the "Red Spot" searchlight for automobiles is offered by the F. W. Wakefield Brass Co., Vermilion, O. The unique feature of this model is a small deflector and lens in the housing of the lamp which throws a red beam to the rear, thus making it a practical one-bulb "parking light."

Motorists will quickly appreciate the economy and desirability of this device. Cars parked at night at the curb or roadside must be lighted front and rear to comply with the law, and for protection against collision. This commonly requires that sidelights and tail light be left burning, sometimes for several hours at a time—a very serious drain upon the batteries, especially in winter when starting takes more than the normal amount of energy.

The manufacturer of this outfit points out that not only does his invention provide adequate and legal front and rear lighting from a single lamp, but that this light is placed in the position on the car which will insure the greatest protection, since the searchlight is invaraibly mounted at the extreme left side and well outside the wind shield frame so that passing vehicles will naturally give the parked car plenty of clearance.

This parking light feature makes the "Red Spot" searchlight a triple-duty accessory. In normal service it is a keen and penetrating searchlight with easily adjustable focus and wide range. In emergency and by a single touch of the finger it becomes a red danger signal. Now, with the rearward deflector and

"Red Spot" Automobile Searchlight with Rearward Deflector and Lens Serving as Parking Lamp.

lens, it becomes also an economical and safe parking lamp. This device is made in 5½-in. and 7-in. diameters.

Notable Export Shipment of Electrical Apparatus for Steel Mill Operation.

Seventeen carloads of electrical equipment for steel-mill operation are now being delivered for installation with what will be the first electrically driven steel blooming mill to be erected in the Far East. This equipment is to replace a steam engine now operating a 40-in. reversing mill.

The mill will form a part of the plant of the Imperial Steel Works of Japan, located near Tokio, and the electrical apparatus is being furnished by the Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.

The blooming mill in question will be capable of rolling steel ingots measuring 0.5 by 0.5 meters (19.7 ins. square) and weighing 3000 kg. (3.3 tons) normal or 5000 kg. (5.5 tons) maximum. The capacity will be 50 tons per hour.

The mill will be operated by a 3500-hp. single-unit motor, of the reversing blooming-mill type, taking direct-current power at a voltage of 600 and operating with a speed range of 0 to 100 r.p.m. To supply power to the motor a flywheel motor-generator set is being furnished. The direct-current generator is of 2800 kw. capacity, 600 volts, 368 r.p.m. It will be connected in series with the reversing motor and is designed to stand the same momentary current peaks as the reversing motor. The generator is driven by a 2500-hp., 8-pole alternating-current motor of the wound-rotor induction type, taking 3-phase power at 3400 volts, 25 cycles and operating at a speed of 368 r.p.m. A slip regulator is used to control this set. A notable feature of the motor-generator set is a 75,000-lb. cast-steel flywheel measuring 14 ft. 9 ins. in diameter.

For field excitation, there is being furnished a motor-driven exciter set consisting of one 32½-kw., 125-volt, constant-potential exciter, one 12½-kw., 125-volt, variable-potential exciter, and a 70-hp., three-phase, 25-cycle, 220-volt driving motor, all direct-connected and mounted on a common bedplate.

Accessories used with the foregoing equipment are a Sirocco blower driven by a 40-hp. three-phase, 25-cycle, 220-volt squirrel-cage induction motor; an air washer to be used in connection with the blower; and a 125-kv-a. 3400/220-volt, three-phase, 25-cycle transformer (connected high-voltage side in star, and low-voltage side in delta) to supply power for the exciter set and blower motor.

Another part of the shipment comprises switchboard panels containing instruments, switches, circuit-breakers, shunts and relays for the control of the motors, generators and feeders. Additional equipment includes disconnecting switches, oil circuit-breakers, and current transformers to be mounted on pipe framing.

A Motor and Gasoline-Engine-Driven Fire Pump.

It is always desirable to have two independent sources of power for a fire pump so as to lessen the chances of its being put out of commission when a fire occurs. In some states a double drive is required by the underwriters' regulations.

The usual form of drive is a steam engine and electric motor, though where there are two separate sources of current two electric motors are frequently used. Sometimes neither steam nor a second source of current is available, and in that case a pump driven by a motor and internal combustion engine can be used.

This pump is of 1500 g.p.m. capacity and is driven by a Westinghouse 150-hp. alternating-current motor and a 140-hp. gasoline engine. It is built by the Lea-Courtney Co., Newark, N. J.

Trade Activities

Diamond Specialties to Move Factory to Newark—National Carbon Company's Prize Contest—New Trade Literature

W. B. Richards & Co., whose New York office is at 71 Broadway, announce that Ralph S. Rainsford, formerly with J. G. White & Co., Inc., has become vice president of the company. The firm has offices in Boston and Chicago as well as in New York.

Commercial Electric Co. has been incorporated at Seattle, Wash., by A. B. Nelson and associates to build and sell a farm lighting unit of its own design, and to install marine lighting equipment, including the "Ceco" set. Mr. Nelson was formerly connected with the Boat Lighting & Equipment Co.

Harvey Hubbell, Inc., Bridgeport, Conn., is sending out to the trade a new trade discount sheet, dated Nov. 14. Numerous changes on Hubbell material are shown, these applying on Schedules C-1, C-3, D, G, E and H, which include various types of reflectors, shade holders, lamp guards and plug material.

American Steam Conveyor Corp., Chicago, manufacturer of all types of equipment for the economical handling of ashes, soot, coal siftings and similar material, is sending out a new folder which has for its title "A Yard of Installations." It shows in an attractive panel views of installations of the American steam ash conveyor. The folder itself is about a yard in length, as its title indicates, and depicts 19 or 20 installations of this equipment. An attractive post card accompanies the folder and aids in giving the interested prospect an opportunity to secure further information. This folder is being extensively distributed among power plant executives and is one of a series being issued.

Allis-Chalmers Manufacturing Co., Milwaukee, Wis., is distributing bulletin No. 1532-A devoted to Allis-Chalmers oil engines of the Diesel type. This publication comprises 20 pages and fully explains the operation and detailed construction of the Allis-Chalmers Diesel type of oil engine which, it is claimed, combines all the economical advantages of the Diesel system, together with special constructive features essential for reliability in service. The engine is of the four stroke cycle horizontal type with an open fuel nozzle and a low pressure starting system. These features simplify the design and overcome the chief objections of inaccessibility, uncertain piston lubrication and the clogging of the fuel nozzle, to which the older types were subject. The bulletin is well illustrated with cross-sectional and longitudinal views of the engine, diagrams, views of typical installations, and the various parts entering into its construction.

Cooper Hewitt Electric Co. on Oct. 27 and 28 held a convention of its salesmen at the main office of the plant at Hoboken, N. J. About thirty salesmen attended the convention which closed with a dinner at the Hotel Pennsylvania, Tuesday night, Oct. 28.

Edison Electric Appliance Co., 5600 West Taylor street, Chicago, recently issued a new pamphlet describing the "Hotpoint" engine and carburetor heater, which is nationally recommended by dealers as a winter driving necessity for easy starting on cold mornings. This is an electric heating device quickly attached to a garage light socket, placed under the hood of the car, where a steady, uniform heat is concentrated to keep the motor primed for an instant start on a cool morning.

Charles C. Moore & Co., San Francisco and Seattle, have an order for building and installing two new generating units in the mill of Bloedel-Donovan Lumber Co., at Bellingham, Wash. There will be one 2000-kw. unit and one of 1000-kw., to be housed in a concrete building. This firm has an order to furnish three Stirling boilers of 500-hp. each in the plant of Crown Willamette Paper Co. at West Lynn, Ore.; and to install two similar boilers in the paper plant of Pacific Mills, Ltd., at Ocean Falls, B. C.; also, two 500-hp. boilers in plant of E. K. Wood Lumber Co., Bellingham, Wash., and two 500-hp. B. & W. boilers in the plant of Granby Consolidated Mining & Smelting Co., at Granby, B. C.

Cutler-Hammer Manufacturing Co., Milwaukee and New York, is distributing a new booklet on electrical operation of gate valves, which contains a reprint of an address given by Peter Payne Dean before the Metropolitan Section of the American Society of Mechanical Engineers. Several illustrations and drawings have been added to aid the description of the Dean system of electrical control of gate valves. Primarily, the Dean control system consists of a totally enclosed waterproof driving motor, reduction gears and limit trip mechanism combined into a single unit for the operation of the valve gate. The control of the valves is secured by means of one or more remote control stations. The booklet makes mention of the desirability of having remote controlled valves in power stations, waterworks, dry docks, refrigerating plants and oil refineries. It describes some of the standard valves and explains how these may be equipped for power operation with remote control without removing the valve or putting it out of service.

Black & Decker Manufacturing Co., Baltimore, manufacturer of portable electric tools, has placed A. E. Nordwall in charge of the Seattle branch, with headquarters at 201 Maynard building. Mr. Nordwall will have charge of the distribution of the company's products in the state of Washington, under the direction of the main Pacific coast office, 918 Hearst building, San Francisco.

Diamond Electric Specialties Corp., successor to the Import Sales Co., New York City, has purchased from H. Sobo & Sons, Newark, N. J., their three-story brick building located at 101-03 South Orange avenue. The Diamond company will use the premises for the manufacture of its well-known line of Diamond flashlights, batteries and Diamond electric Christmas tree outfits, which heretofore have been manufactured at 27-33 West 20th street, New York. The structure has a frontage of 65 ft. on South Orange avenue and a depth of 100 ft. on Richmond street. The Diamond company was attracted to Newark by the excellent manufacturing and labor advantages afforded in that city, and will take possession of the new quarters after Jan. 1, 1920.

National Carbon Co., Cleveland, Ohio, manufacturer of batteries and carbon products, recently conducted a contest for an appropriate name for its new house organ, which will be published periodically in the interests of salesmen, jobbers and jobbers' salesmen. It was a departure from the usual prize award for similar activities in that an offer of a suit of clothes was made the incentive for suggesting a title. Names were received from all parts of the country, many from owners, presidents, sales managers and advertising managers of progressive concerns. The name selected by the judges was "Columbia Hot Shot," which was considered ideal in implying the purpose of the publication, suggestive of the company's products and in being "catchy," short and easy to pronounce. Instead of one winner, there were 12 salesmen of jobbers and one salesman of the company who each received a check of $75 with which to purchase a new suit of clothes. Eight other contestants were given recognition by the company by the award of a $15 prize for a pair of shoes. In sending the checks which totaled over $1,000 to the winners, the company inferred that the amount of $75 for a suit and $15 for shoes would cover the cost of this apparel, but assumed no obligation for the market fluctuation which might ensue between the time the prizes were mailed and the date when checks were received.

Current News

Weekly Record of Construction Activities—Conventions

EASTERN STATES.

New Bedford, Mass.—Leigh & Butler, 232 Summer street, Boston, manufacturers of textile machinery, etc., have completed negotiations for the acquirement of the plant formerly occupied by the Baker Manufacturing Co., New Bedford, and will utilize the structure for the establishment of a new plant. Considerable electrical equipment will be required in connection with the new work.

Windsor, Conn.—General Electric Co., Schenectady, N. Y., will double the capacity of its plant here by the erection of a building of 40,000 sq. ft.

Binghamton, N. Y.—An appropriation of $25,000 has been made for ornamental lighting and underground conduit system. Address city clerk.

Lancaster, N. Y.—Plans are under consideration by the Depew & Lancaster Light, Power & Conduit Co., operating in Erie county, for the construction of an electric power plant at Alden, N. Y., for furnishing service to local and neighboring districts.

Little Falls, N. Y.—Barnet Leather Co., Inc., 81 Fulton street, New York, is considering plans for the construction of a new one-story brick addition to its plant at Little Falls. The structure will be about 25x40 ft., and is estimated to cost $7,000. L. E. White is local manager.

New York, N. Y.—Melville Clark Piano Company, 518 West 55th street, has had plans prepared for the construction of a one-story concrete boiler plant addition to its works about 60x93 ft., to be located on 135th street, near Locust avenue. The structure is estimated to cost $20,000.

New York, N. Y.—It is expected that Westinghouse, Church, Kerr & Co. will be in the market soon for electric cranes for a fertilizer plant in Baltimore for Armour & Co.

Sayville, L. I., N. Y.—Navy Department has authorized the immediate installation of new radio apparatus at the local radio transmission station, estimated to cost about $50,000. The new equipment will be of the high-speed sending type recently perfected. The work also includes improvements in the present receiving equipment at the plant.

Oneida, N. Y.—The common council voted to accept the proposition of the Adirondack Electric Co. for ornamental lights in Madison street. Mayor Munson was authorized to sign the contract.

Bloomfield, N. J.—Sprague Electric Works of the General Electric Co. has filed plans for the construction of a new addition to its plant. It is understood that a portion of the proposed extension will be used for storage purposes; the building is to cost about $40,000.

Cape May, N. J.—Fire on Dec. 1 damaged the plant of the Cape May Illuminating Co. to the extent of approximately $5,000. It is understood that the company is considering plans for immediate rebuilding.

Dover, N. J.—New Jersey Power & Light Co. has been awarded a contract by the Mountain Ice Co. for furnishing electric energy for the operation of its plant for a period of five years. The company is planning for the extension of its electric system to the Dickerson mine of the Wharton Steel Co. for the serving of a motor load of 600 hp.

Jersey City, N. J.—Burke Brothers Co. has had plans prepared for the erection of a new boiler plant at its property at 380-84 5th street.

Kearny, N. J.—Town council is considering plans for the installation of a new arc lighting system in Kearny avenue. It is proposed to inaugurate work on the improvement at once.

Newark, N. J.—American Platinum Works, 231 New Jersey Railroad avenue, is making rapid progress on the construction of its proposed factory and boiler plant, to be located at Oliver and New Jersey Railroad avenues. It is understood that the work will be completed at an early date.

Newark, N. J.—John Campbell & Co., Monticello, N. Y., has had plans prepared for the construction of a new two-story factory and boiler plant, about 10x125 ft., at 13-23 New York avenue. The structure is estimated to cost $50,000.

Newark, N. J.—Dye Products Chemical Co., 202 Vanderpool street, has had plans prepared for the erection of a new one-story boiler plant addition to its works. William E. Lehman, 738 Broad street, is architect.

Port Norris, N. J.—Plans are under consideration by the Township Committee for the installation of new street lighting systems in Port Norris, Mauricetown, Bivalse and Haleyville.

Allentown, Pa.—Phoenix Silk Manufacturing Co. is having plans prepared for the construction of a new central power plant, to be utilized for the furnishing of light and heat for its two local mills. The company has been granted permission by the city council to install an underground conduit system between its Adelaide Mill and its ribbon mill in connection with the proposed construction.

Chester, Pa.—American Locomotive Co., 30 Church street, New York, has awarded a contract to Almirall & Co., Inc., 1 Dominick street, New York, for the construction of a new one-story power house at its local plant, about 80x100 ft., to be located on East Dunkirk street.

Connellsville, Pa.—Yough Electric Co. is having plans prepared for a plant.

Littleton, Pa.—Board of Managers of the Hoffman Orphanage is having preliminary plans prepared for the construction of a new one-story central heating plant for the institution, to cost about $15,000. Rev. Andrew H. Smith is in charge.

Liverpool, Pa.—Juniata Light & Service Co. has commenced work on the extension of its electric system to the upper section of the borough to furnish service for lighting. It is understood that a new street-lighting system will also be installed in this district.

Philadelphia, Pa.—Pennsylvania Forge Co., Jenks and Bath streets, has awarded a contract to the William G. Donley Co., Drexel building, for the erection of a new one-story brick power house addition to its plant, about 42x51 ft. The structure is estimated to cost about $5,000.

Philadelphia, Pa.—Philadelphia Electric Co. has awarded a contract to the Stone & Webster Engineering Corp., Boston, Mass., for the construction of its proposed one-story reinforced concrete power station at Beach and Palmer streets. The structure will be about 197x300 ft., and with equipment installation will cost about $5,000,000.

Pittsburgh, Pa.—Jones & Laughlin Steel Co. has filed plans for the erection of a new one-story brick and steel pump house to be located on Second avenue, near Bates street.

Reading, Pa.—Lebanon Steel Co. has had plans prepared for the construction of a new one-story air-compressor building and substation, about 33x39 ft., at its plant.

Scranton, Pa.—Delaware, Lackawanna & Western Railroad Co. has awarded a contract for the foundations for the proposed power plant to be located in the vicinity of Nanticoke, Pa. It is proposed to call for bids for the superstructure early in the coming spring. The new plant is estimated to cost $75,000.

Danville, Va.—Danville Valley Power Co. has been incorporated with a capital of $50,000. H. L. Mitchell and others are interested. The company will build a hydroelectric plant which will be located in Walnut Cove.

Baltimore, Md.—Kaufman Beef Co. has had plans prepared for the con-

struction of a new packing plant and power house, to be located at Sixth street, near Wilkens avenue.

Murphy, N. C.—The city plans to construct a 500 to 700-hp. hydroelectric power plant. Address mayor.

Newbern, N. C.—City is having plans prepared for extensions in the municipal electric lighting plant to increase the present capacity.

Laurens, S. C.—Watts Mills Co. is having plans prepared for the installation of a new transmission system for the purpose of furnishing electric lighting for its mill village and operatives' homes. The work is estimated to cost $15,000. Power is furnished by the Reedy River Power Co. George M. Wright is president.

Ridgeville, S. C.—H. R. Elsworth is in market for a private electric plant.

Melbourne, Fla.—An electric light plant will be established by the Melbourne Beach Co.

St. Petersburg, Fla.—W. D. McAdoo and others contemplate the construction of an electric railway between St. Petersburg and St. Petersburg Beach.

NORTH CENTRAL STATES.

Dayton, O.—Domestic Engineering Co. has purchased the 4-story plant of the Mutual Manufacturing Co., and will use it for making farm lighting systems.

Detroit, Mich.—Mutual Electric & Machine Co., 232 West Fort street, will build a 3-story plant addition to cost $12,000.

Detroit, Mich.—A 1-story plant, 100x120 ft., and a boiler house 40x50 ft. will be erected by the General Carbonic Co. at a cost of $150,000.

Grand Rapids, Mich.—A hydroelectric power plant capable of generating 2500 hp. will be added to the present plant of the Consolidated Water Power & Paper Co., the new building to be completed by next fall. Power for the new paper machines to be installed by the company will be furnished, and surplus power will be sold to concerns in the city. The company is also planning to erect a new sulphite mill to cost more than $500,000.

Manistee, Mich.—An electric railroad is proposed between Manistee and Arcadia. Address J. N. Junge.

Evansville, Ind. — Architect Gilbert Karges, 305 Furniture Exchange building, Indianapolis, Ind., has prepared plans and will let contract for a $75,000 power plant to be erected by Globe-Besse-World Furniture Co., Evansville, Ind. The building will be of brick, steel and concrete construction. Specifications include a freight elevator, steam heating, plumbing and electric lighting.

Indianapolis, Ind.—Commercial Engineering Co. has increased its capital stock from $50,000 to $100,000.

South Bend, Ind.—Heavy rains are saving 100 tons of coal a day for the Indiana & Michigan Electric Co.'s power plant. The St. Joseph river, swollen far beyond its height for this season of the year, is generating enough power to make the use of coal almost negligible.

DATES AHEAD.

Electric Power Club. Meeting, Hot Springs, Va., Dec. 11, 12 and 13. Headquarters, Homestead Hotel. Secretary, C. H. Roth, 1410 West Adams street, Chicago.

American Society of Civil Engineers. Annual meeting, New York City, Jan. 21-22, 1920. Secretary, Charles W. Hunt, 33 West 39th street, New York City.

National Council of Lighting Fixture Manufacturers. Annual convention, Detroit, Mich., February, 1920. Secretary-treasurer, Charles H. Hofrichter, Cleveland, O.

Oklahoma Utilities Association. Annual convention, Oklahoma City, Feb. 10-13, 1920. Secretary, H. A. Lane, 611 State National Bank building, Oklahoma City.

American Electrochemical Society. Annual convention, Boston, Mass., April 7-10, 1920. Friday, April 9, joint session with American Institute of Electrical Engineers on "Electrically Produced Alloys." Secretary, Joseph W. Richards, Bethlehem, Pa.

National Electric Light Association. Annual convention, Pasadena, Cal., May 18-21, 1920. Headquarters, Hotel Huntington. Acting secretary, S. A. Sewall, 29 West 39th street, New York City.

Mahomet, Ill.—This village is to have an electric light system, a high-tension line to be constructed from Champaign to Mahomet for the purpose of supplying current. Power will be furnished by the Urbana & Champaign Railway, Gas & Electric Co., a subsidiary of the Illinois Traction System.

Bruce, Wis.—A bond issue of $12,000 has been approved for the construction of a municipal lighting system.

Chippewa Falls, Wis.—Wisconsin-Minnesota Light & Power Co. will erect a power line between Stanley and Chippewa Falls to carry current from Wiasota dam to consumers along Soo railway.

Sheboygan, Wis. — Citizen's Telephone Co. will make additions to system at an estimated cost of $85,000.

Marceline, Mo. — Plans are under consideration by the city officials for the construction of a new municipal electric plant.

St. Louis, Mo.—Emerson Electric Co. has purchased a site for a large commercial structure, adjoining on the east the company's present quarters. The projected building, plans for which are being prepared, will be a 7-story structure.

Chanute, Kan.—Architect I. R. Timlin, Boatmen's Bank building, St. Louis, has prepared plans for a $15,000 telephone exchange. Contract let to Geo. W. Copley, Chanute, Kan. Owner Southwestern Bell Telephone Co., Boatmen's Bank building, St. Louis, Mo.

Iola, Kan.—Archt. I. R. Timlin, Boatmen's Bank building, St. Louis, has prepared plans for a $15,000 telephone exchange. Owner Southwestern Bell Telephone Co., Boatmen's Bank building, St. Louis, Mo.

Beatrice, Neb.—Consolidated Electric Co. will build a transmission line from Homeville to Filley, Virginia and Rockford.

Guide Rock, Neb.—Bonds have been voted for installing an electric light system in the city.

Havelock, Neb.—Omaha, Lincoln & Beatrice Interurban Railroad Co., Ralston, has asked for a franchise to construct lines through Havelock. Mr. Bramlette, general manager.

Lebanon, Neb.—The city will hold an election for a bond issue for an electric plant. The erection of a transmission line from the McCook Electric Co., McCook, is also contemplated. Danbury will also secure light from the lines of the McCook company.

Prague, Neb.—The city has voted to issue $12,000 electric light bonds. Work on the line will commence at once, it being an extension of the Blue River Light & Power Co.'s line from Brainard to the towns of Bruno, Abie and Prague.

Scribner, Neb.—City will construct electric lighting plant. Estimated cost, $35,000.

SOUTH CENTRAL STATES.

Birmingham, Ala.—Sloss-Sheffield Steel & Iron Co. is having plans prepared for the construction of a new power house addition to its plant, to cost about $9000.

Birmingham, Ala.—Birmingham Light & Power Co. has had plans prepared for the construction of a new local electric substation, to be equipped with 1000-kw. rotary converter with switchboards, as well as auxiliary apparatus. L. L. Newman is engineer.

Amite, La.—Central Light & Power Co. is understood to be considering plans for increasing the present capacity of its plant. New machinery and equipment will be installed.

Boyce, La.—City officials are planning for a bond issue of $30,000, the proceeds to be used for improvements and extensions in the municipal electric light and water plants. Xavier A. Kramer, Magnolia, Miss., is consulting engineer.

Monroe, La.—Plans are under consideration by the city for the construction of a new electric plant and waterworks system, a bond issue for $450,000 to cover the cost of the proposed work having been passed. Arnold Bernstein is mayor; Walter G. Kirkpatrick is consulting engineer.

Fort Smith, Ark. — Fort Smith Light & Traction Co. is preparing to enlarge its power plant by the erection of an addition to cost $250,000.

Sallisaw, Okla.—City has completed arrangements for improvements and extensions in the municipal electric light plant, to cost about $30,000.

Clarendon, Tex. — Texas Gas & Power Co. is considering plans for extensions and improvements in its electric light plant to increase its present capacity. Plans and specifications will be prepared at once.

Dallas, Tex. — Dallas Power & Light Co. has purchased a 15-acre tract of land on which it proposed to erect a reserve oil storage tank. The

tank is to be of 50,000-bbl. capacity and will be erected to insure continuity of service at such times when oil could not be delivered through pipe lines or in tank cars.

WESTERN STATES.

Pueblo, Colo. — About $1,000,000 will be spent in 1920 for improvements by the Arkansas Valley Railway Light & Power Co., according to announcement by W. F. Raber, manager of the plant. Among the items of expense is a new power house made necessary by the increased distribution of electricity both for lighting and power purposes and the present plant is inadequate to care for the expanding business much longer. The present plant is only 7500 h.p., while the new plant will be 10,000 hp. and modern in every respect.

Seattle, Wash.—City Council has recently awarded a contract to the Allis-Chalmers Manufacturing Co. for a new 12,500 kw. steam turbine unit, equipped with exciter. Arrangements have also been completed for the installation of boilers and auxiliary apparatus, for increased operations.

Seattle, Wash.—Contract has been awarded to the Pelton Water Wheel Co. by the city for the furnishing of a new 18,000 hp. capacity water wheel, estimated to cost $76,616. A generating unit will also be furnished by the Westinghouse Electric & Manufacturing Co., 14,285 kw. capacity, to cost $63,175.

Wenatchee, Wash.—Plans are under consideration by the Wenatchee Valley Gas & Electric Co. for extensive additions and improvement in its plant. It is proposed to increase the capacity of the Chelan Falls power station by approximately 1000 hp., at an estimated cost of about $80,000. George D. Brown is general manager.

Astoria, Ore. — Plans are under consideration by the Pacific Power & Light Co. for the rebuilding of its repair shop recently destroyed by fire, with loss estimated at about $20,000.

Baker, Ore.—To prevent a recurrence of the present grave lighting and power situation in Baker and Union counties, extensive improvements that may include the installation of one or more power plants will be made by the Eastern Oregon Light & Power Co., according to J. P. Lottridge, manager.

Bend, Ore. — The construction of two power plants along the Fumalo river at a cost of $229,000 for the development of 4325 hp. is contemplated by the Bend Water, Light & Power Co., which filed application with the state engineer's office for permission to appropriate 50 second feet of water from Tumalo creek.

Auburn, Cal.—Pacific Gas & Electric Co. is making rapid progress on the installation of a new power line from its Wise power station for the furnishing of electric energy to the Sacramento Valley district. It is understood that the company is considering plans for the construction of a new power station to be located in the vicinity of Loomis.

Glendale, Cal. — City has recently authorized the issuance of bonds for $260,000, the proceeds to be used for extensions and improvements in the water and light departments. Included in the proposed work will be the construction of a new pumping plant, with equipment, etc., at San Fernando road and Grand View avenue, to cost $33,500; pumping plant at Grand View reservoir; quantity of new pumping equipment in Verdugo canyon; electric generating plant at Verdugo canyon reservoir, and other work.

Manhattan Beach, Cal.—Town officials have voted a bond issue of $30,000, the proceeds to be used for improvements and extensions in the municipal water system.

Orange, Cal. — In connection with the proposed installation by the city trustees of the new ornamental lighting system on Shapman and Glassell streets, J. A. Lieb, Orange, has submitted the low bid, at $18,000.

Richmond, Cal. — Plans are under consideration by the city council for the early installation of a new electrolier system in the business section of the city, to replace the present arc lighting units. The Merchants' Association is interested in the proposed work.

San Francisco, Cal.—Contract has recently been awarded to the Western States Gas & Electric Co. for the furnishing of electric energy for the operation of the proposed new plant of the Fresno Cooperage Co. at Richmond. The company is a subsidiary organization of the California Wine Association, and about 150 hp. will be required.

Woodland, Cal.—Council is understood to be arranging plans for the installation of a new underground conduit system to be utilized for light and power purposes.

FOREIGN TRADE

[Addresses of firms referred to in these trade opportunities may be obtained by writing to the Bureau of Foreign and Domestic Commerce, Washington, D. C., or its branch and local co-operative offices. Request for each opportunity should be on a separate sheet and the file number given.]

Electrical Supplies (31,332).—Samples, catalogs and price lists are desired by a man in Spain with a view to representing firms for the sale of electrical supplies, carpenters and cabinet-makers' tools and accessories, leather and imitation leather visors for military caps, barber supplies, etc. Correspondence should be in Spanish.

Electrical Appliances (31,394).—A firm in England having a branch office in the United States, desires to be placed in touch with manufacturers of electrical labor-saving appliances, with a view to their sale in England. It is particularly interested in washing machines, vacuum cleaners, dishwashing machines, electrical clothes dryers, motor-driven sewing machines. and electric water heating apparatus. Articles of the highest class, and in large quantities are wanted.

Electrical Supplies (31,395).—An importer in France desires to secure an agency for the sale of hardware, enamel ware, household appliances, electrical supplies, novelties, and toys. Reference.

Lighting Equipment (31,399).—A company in Spain desires to secure agencies for the sale of oils, lubricating greases, crude rubber, chemicals, industrial products, cables, wire, switches, portable lamps, insulators, etc. Correspondence should be in Spanish or French. References.

Electric Vehicles (31,402).—A firm in South Africa desires to get in touch with manufacturers with a view to securing an agency for the sale of motor cars, electric or petrol, of a medium and cheap price; also of elevators for passenger and freight.

Electrical Machinery (31,346).—An American firm in Poland, which is planning to erect a machine shop, desires to secure an agency, purchasing goods outright, for the sale of machine tools, agricultural machinery, machinists' tools, and electrical equipment. Quotations should be given f. o. b. New York. Payment cash. References. Catalogs and price lists are requested.

Electric Lamps (31,196).—A business man in Spain desires to purchase and secure an agency for life-saving motor boats, in accordance with specifications which may be secured from the Bureau or its district offices. He also desires machinery for making cans, bottlers, perfumery, etc., filament electric lamps, hardware and tools. Quotations should be given c. i. f Spanish port. Payment preferably by irrevocable credit in any Spanish bank. Correspondence may be in English. Reference.

Electrical Supplies (31,408).—A trading company in Denmark desires to secure an agency on commission for the sale of foodstuffs, chemicals, electrical supplies, steam turbines, machinery, iron and steel for shipyards, anchors and chains. Quotations should be given c. i. f. Copenhagen or other Scandinavian port. Payment, letter of credit in United States. References.

PROPOSALS

Electric Light System.—Bids will be received by Unadilla, Ga., until Dec. 31 for the installation of an electric lighting system and extension of the water works system. Address the mayor.

Electric Light.—Bids will be received until Jan. 21, 1920, for furnishing electric lighting for streets, residences and industries for 10 years to Natchez, Miss., from Jan. 1, 1921. Address mayor.

Electric Light Plant.—Bids will be received Dec. 19 by J. W. Reig, mayor of Tahlequah, Okla., for an electric light and power plant. Specifications are on file with clerk at Tahlequah and can be secured from W. N. Gladson and E. M. Ratliff, engineers, Fayetteville, Ark.

Personals

W. C. Heath, P. S. Pogue, A. J. Lubeck, F. W. Sinram Promoted—Mrs. Walker's Career in Public Utility Literature

GEN. GEORGE H. HARRIES, vice-president of H. M. Byllesby & Co., New York, will address the New York Electrical League at a December meeting.

HORACE C. DU VAL at a recent meeting of the board of directors, was elected a director of the Brooklyn Edison Co., Inc., Brooklyn, N. Y., to fill the vacancy occasioned by the death of the late James N. Wallace.

J. H. DEPPELER, of the Metal & Thermit Corp., has been elected a vice-president of the American Welding Society, and P. F. Willis, president of the Henderson-Willis Welding & Cutting Co., elected a director of the society.

W. P. NASER, whose resignation as manager of the Trumbull Electric Manufacturing Co., Chicago, was announced in the Aug. 23 issue of ELECTRICAL REVIEW, has accepted the appointment of general manager of the Northern Electric Co, with executive and main offices in Minneapolis, with a branch office in Duluth. Mr. Naser was connected with the Trumbull company for nearly 7 years. During the World's Fair he opened an office in San Francisco and was later promoted to the larger Chicago branch of the company.

W. C. HEATH, assistant general superintendent of Fairbanks, Morse & Co., Chicago, was recently promoted to the office of general superintendent of the Beloit (Wis.) plant. Mr. Heath joined the company in May, 1909, as a draftsman, after leaving Lewis Institute, and by reason by his ability, industry and character, was rapidly advanced in the organization. After spending about 7 years in detail and general designing work in the engineering department, he was transferred to the shops where for a time he looked after drawings, production schedules, standardization and similar matters. He was later appointed superintendent of the BW shop and then promoted to the position of assistant general superintendent.

PHILLIP S. POGUE, general manager of the Louisville Home Telephone Co., Louisville, Ky., for the past 10 years, has been elected president of the company, succeeding E. H. Cady, resigned. Mr. Pogue has been with the Louisville Home company since its inception. After assisting in the construction of the plant in 1901-2, he served as purchasing agent for a year. He was later made general superintendent, in which capacity he continued until 1907, when he was promoted to the position of general manager. He is vice-president and director of the Louisville Heating Co., director of the Louisville Gas & Electric Co., the vice-president of the Kentucky Association of Public Utilities. He is a member of the Pendennis Club, the Engineers and Architects Club and the Jovian Order.

C. W. JOHNSON, general superintendent of the Westinghouse Electric & Manufacturing Co., Pittsburgh, Pa., delivered an interesting address at the December meeting of the Industrial Supervisors' Club of Pittsburgh, held on December 3.

ARTHUR J. LUBECK, whose appointment as assistant western sales manager of the Hart & Hegeman Manufacturing Co., Chicago, was recorded in a recent issue of ELECTRICAL REVIEW, has been promoted to the position of sales manager of the Chicago district, succeeding Haynes L. Everest, who has been appointed general sales manager, with headquarters at Hartford, Conn. Prior to his connection with the Hart & Hegeman company Mr. Lubeck

Arthur J. Lubeck.

was for a number of years in the service of the Benjamin Electric Manufacturing Co., Chicago, serving for 5 years as sales representative in the Middle West. When in May, 1917, the Detroit office of the company was opened, he was appointed manager of that office, having charge of sales in the states of Michigan, Minnesota and Wisconsin, and continued in this capacity until last September, when he resigned to become assistant western sales manager of the Hart & Hegeman company.

FRDERICK W. SINRAM, who since the death of H. H. Hodell about 2 years ago has acted as head of the Van Dorn & Dutton Co., Cleveland, was recently elected president of the company. This recognition of his services comes after a period of 9 years' service with the company, which began in 1910 when he was made secretary and manager of sales. In 1911 he was elected treasurer of the company, retaining the duties of secretary. He is also treasurer of the Van Dorn Electric Tool Co., and since its organization, about 3 years ago, has been president of the American Gear Manufacturers' Association.

MRS. STELLA FORD WALKER, who is contributing Part VI to the series of articles by H. E. Eisenmenger on "Central-Station Rates in Theory and Practice" appearing in the ELECTRICAL REVIEW weekly since last July, is an experienced student and analyst of public utility regulation by commissions. A graduate of the University of Wisconsin with the degree Bachelor of Arts, she joined the staff of the Railroad Commission of Wisconsin, which she served for 2 years, principally in analyzing and indexing the decisions of the Commission and preparing syllabi in final form for publication. On leaving the Wisconsin Commission's staff she became associate editor of *Rate Research*, the weekly publication of the Rate Research Committee of the National Electric Light Association. This work involved painstaking preparation of abstracts of commission rulings, reviews of court decisions affecting utility companies, digests of state utility laws, besides many special reports and papers on a variety of related subjects, such as going value, rate of return, franchise regulation, discrimination, etc. For nearly 6 years Mrs. Walker had practically complete responsibility of compiling and editing *Rate Research*. During the recent war, when her husband joined the army Mrs. Walker engaged in war camp community service. Since then she has engaged in varied literary work. Mrs. Walker is a well versed, lucid and fluent writer on the many phases of public utility relations, as is readily manifest from perusal of her articles on commission regulation in last week's and the present issue of the ELECTRICAL REVIEW. These articles will be continued in the next two issues.

Obituary.

ALFRED H. MEECH, aged 55 years, an electrical engineer and inventor of an elevator lift air brake, died Nov. 28 in New York.

WILLIAM E. RICE, former president of Washburn & Moen Mfg. Co., and later connected with the American Steel & Wire Co. for many years, died in Worcester, Mass., Dec. 2, at the age of 86 years.

ROBERT FARIES, founder and president of the Faries Manufacturing Co., Decatur, Ill., manufacturer of pumps, regulators, electrical fittings and fixtures, etc., passed away on Nov. 17 at the age of 82 years. He was one of the first men, if not the first, to devise adjustable fixtures for electric lights, and in that line of manufacture and in the manufacture of fixtures for display windows, the business he established has grown to large proportions. He was a leader in industry in Decatur for 50 years and his passing is mourned by the community as well as his many friends in the industry.

Financial News

Little Rock Company to Extend Lines.

Permission has been granted by the Arkansas Corporation Commission to the Little Rock Railway & Electric Co. to sell $376,500 of bonds. The proceeds of this bond issue will be used to make extensive improvements in its plant, extend its electric transmission lines and improve its service generally. The bonds are to be sold at not less than 80 and will bear 6% interest.

American Public Service Offering.

The National City Co. is offering $215,000 first lien 6% bonds of the American Public Service Co., dated Dec. 1, 1912, and falling due Dec. 1, 1942, at 93 and interest, to yield 6.60%. The bonds are redeemable on any interest date at 105 and accrued interest upon 60 days' notice. The American Public Service Co. was incorporated in Delaware in October, 1912, and has acquired the entire capital stock and the bonds of eighteen public utility operating companies situated in eastern Oklahoma and central and eastern Texas.

Standard Gas & Electric Calls Dividend Scrip for Redemption.

Standard Gas & Electric Co. has called for redemption $202,144 outstanding dividend scrip issued several years ago. After Dec. 15 it will cease to bear interest. The scrip will be redeemed at the company's office, Chicago, at face value and accrued interest, in accordance with the following notice from Robert J. Graf, secretary:

"Standard Gas & Electric Co. hereby calls all of its outstanding dividend scrip for payment at its office, Room 1900 Continental and Commercial Bank building, Chicago, Ill., on Dec. 15, 1919. Said dividend scrip will be redeemed at its face value and accrued interest to Dec. 15, 1919.

"You are hereby notified to present your scrip at the said office of the company for payment on said date. On and after said date, interest on said scrip will cease."

Pacific Gas-Sierra Companies' Power Lease in Detail.

In leasing properties of Sierra & San Francisco Power Co. for 15 years, Pacific Gas & Electric Co. will assume responsibility for all fixed charges, according to announcement made by A. F. Hockenbeamer, vice-president of the latter company. These charges during the fiscal year ended June 30, 1919, amounted to $863,567. In addition company will set aside a small amount for bond discount.

Pacific Gas & Electric Co. for the first year will pay a rental of $50,000, $100,000 for the second and third years and $150,000 annually thereafter. In addition Pacific Gas & Electric agrees to maintain the properties in their present state, advancing money to make any additions and extensions required by the California Railroad Commission, taking first mortgage bonds of the Sierra Co. in payment.

Assumption of the fixed charges of the Sierra company by Pacific Gas Company is no doubt responsible for the activity and strength of the series B fives of 1949 of the former company recently. The lease will now go before the state commission for approval. In taking over the plants of Sierra company Pacific Gas Company acquires the 28,000-kw. steam plant located in San Francisco. Major part of the output of Sierra company is sold to United Railroads of San Francisco. The Pacific Gas & Electric Co. will assume this contract under the terms of the lease.

Dividends.

Detroit Edison Co. has declared a quarterly dividend on 2%, payable Jan. 15 to stock of record Jan. 2, 1920.

Babcock & Wilcox Co. has declared a quarterly dividend of 2%, payable Jan. 1, 1920, to stockholders of record Dec. 20.

American Public Service Co. has declared a quarterly dividend of 1¾% on preferred stock, payable Jan. 2 to stock of record Dec. 15.

The board of directors of the Buffalo General Electric Co. has declared a quarterly dividend of 2%, payable Dec. 31 to stock of record Dec. 20.

Twin City Railway & Light Co. has declared a quarterly dividend of 1¾% on preferred stock, payable Jan. 2, 1920, to stockholders of record Dec. 20.

Electric Storage Battery Co. has declared a quarterly dividend of $2.50 per share on both common and preferred stocks, payable Jan. 2 to stockholders of record Dec. 15.

The board of directors of the Springfield Railway & Light Co. has declared a quarterly dividend of 1¾% on preferred stock, payable Jan. 2 to stockholders of record Dec. 15.

The regular quarterly dividend of 1½% on the issued and outstanding preferred stock of the American Gas & Electric Co. has been declared, payable Feb. 2 to stock of record Jan. 16.

Manhattan Electrical Supply Co. has declared the regular quarterly dividends of 1% on common stock and 1¾% on both the first and second preferred stocks. Both dividends are payable Jan. 2 to stock of record Dec. 20.

Niagara Falls Power Co. has declared a dividend of $1.00 per share on common stock, payable Dec. 15 to stock of record Dec. 10; also a dividend of $1.75 per share on preferred stock, payable Jan. 15, 1920, to stock of record Dec. 31.

The Allis-Chalmers Manufacturing Co. has declared a quarterly dividend of 1¾% and an additional dividend of 1¾% in payment of the remaining unpaid and accumulated dividends on the preferred stock of the company, both dividends payable Jan. 15 to the stock of record Dec. 31.

Earnings.

LAKE SHORE ELECTRIC RAILWAY SYSTEM.

	1919.	1918.
September gross	$ 232,645	$ 216,052
Net after taxes	71,231	65,481
Surplus after charges	35,831	29,593
9 months' gross	1,940,762	1,633,750
Net after taxes	547,359	471,227
Surplus after charges	225,409	145,937

CONSUMERS POWER CO.

Earnings of this subsidiary of Commonwealth Power, Railway & Light Co. compare as follows:

	1919.	1918.
October gross	$ 721,249	$ 582,240
Net earnings	342,391	268,832
Surplus after charges	174,029	100,713
Bal. after pref. div.	123,534	50,506
12 months' gross	7,904,824	6,381,701
Net earnings	4,191,644	3,236,838
Surplus after charges	1,987,295	1,413,119
Bal. after pref. div.	1,382,511	814,250

Surplus after charges as shown is available for dividends, replacements and depreciation. Fixed charges include taxes.

DETROIT EDISON CO.

Consolidated statement of Detroit Edison Co., including all constituent companies, compares as follows for October and 10 months ended Oct. 31:

	1919.	1918.
October gross	$1,539,272	$1,268,289
Net after taxes	356,802	356,514
Surplus after charges	208,254	228,256
10 months' gross	13,130,801	11,063,958
Net after taxes	3,355,515	2,866,765
Surplus after charges	1,947,685	1,770,502

DAYTON POWER & LIGHT CO.

	1919.	1918.
October gross	$ 259,176	$ 218,689
Net after taxes	83,564	65,458
Surplus after charges	22,497	23,367
Balance after preferred dividend	5,987	8,148

WEEKLY COMPARISON OF CLOSING BID PRICES OF SECURITIES OF LEADING ELECTRICAL COMPANIES.

Quotations furnished by F. M. Zeller & Co., Rookery Bldg., Chicago.

	Div. rate Per cent	Bid Dec. 2.	Bid Dec. 9.
Public Utilities.			
Adirondack Electric Power of Glens Falls, common	6	..	14
Adirondack Electric Power of Glens Falls, preferred	6	76	76
American Gas & Electric of New York, common	10+extra	125	124
American Gas & Electric of New York, preferred	6	39	39
American Light & Traction of New York, common	..	208	208
American Light & Traction of New York, preferred	6	93	92
American Power & Light of New York, common	4	60	60
American Power & Light of New York, preferred	6	72	73
American Public Utilities of Grand Rapids, common	..	8	8
American Public Utilities of Grand Rapids, preferred	7	23	22
American Telephone & Telegraph of New York	..	99¾	99¼
American Water Works & Elec. of New York, common	..	3	3
American Water Works & Elec. of New York, particip	7	8	9
American Water Works & Elec. of New York, first preferred	..	45	45
Appalachian Power, common	..	3	4
Appalachian Power, preferred	7	21	21
Cities Service of New York, common	+extra	410	405
Cities Service of New York, preferred	6	75½	73½
Commonwealth Edison of Chicago	8	109½	108
Comm. Power, Railway & Light of Jackson, common	..	20	21
Comm. Power, Railway & Light of Jackson, preferred	6	45	45
Federal Light & Traction of New York, common	..	7	7
Federal Light & Traction of New York, preferred	..	43	42
Illinois Northern Utilities of Dixon	6	..	..
Middle West Utilities of Chicago, common	2+extra	25	25
Middle West Utilities of Chicago, preferred	6	48	48
Northern States Power of Chicago, common	..	63	63
Northern States Power of Chicago, preferred	ex.div.7	89	90
Pacific Gas & Electric of San Francisco, common	..	60½	63
Pacific Gas & Electric of San Francisco, preferred	6	..	..
Public Service of Northern Illinois, Chicago, common	7	80	80
Public Service of Northern Illinois, Chicago, preferred	6	85	85
Republic Railway & Light of Youngstown, common	4	16	13
Republic Railway & Light of Youngstown, preferred	6	50	48
Standard Gas & Electric of Chicago, common	..	27½	27½
Standard Gas & Electric of Chicago, preferred	6	41	41¾
Tennessee Railway, Light & Power of Chattanooga, common	..	2½	3
Tennessee Railway, Light & Power of Chattanooga, preferred	6	5	5
United Light & Railways of Grand Rapids, common	4	41	41½
United Light & Railways of Grand Rapid, preferred	6	65	67
Western Power of San Francisco, common	..	21	27
Western Union Telegraph of New York	extra	89¼	89½
Industries.			
Electric Storage of Philadelphia, common	4	135	137
General Electric of Schenectady	8	173½	168
Westinghouse Electric & Mfg. of Pittsburgh, common	7	51¾	53½
Westinghouse Electric & Mfg. of Pittsburgh, preferred	7	..	..